

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**THE ISLAMIC REPUBLIC OF AFGHANISTAN**

**DATA COLLECTION SURVEY  
ON IRRIGATION METHOD IN RURAL AREA  
OF AFGHANISTAN**

**COMPLETION REPORT**

**MARCH 2023**

**CTI ENGINEERING INTERNATIONAL CO., LTD.**

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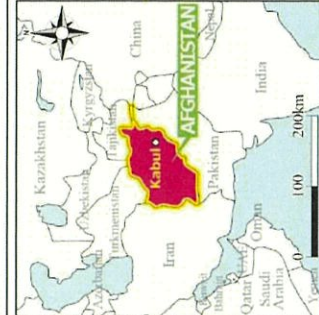
**CURRENCY EXCHANGE RATES  
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**USD 1.00 = AFN 81.106**

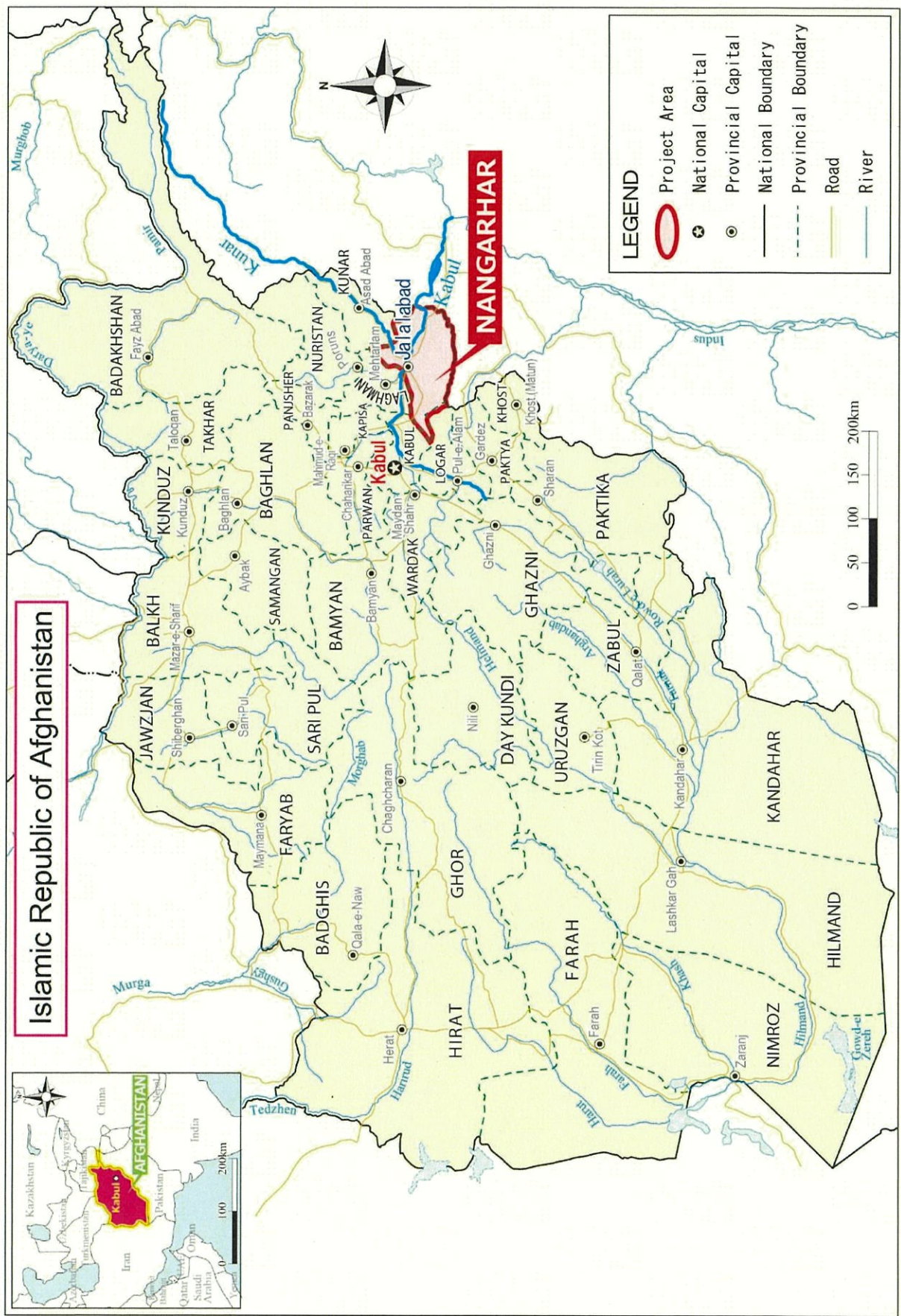
**USD 1.00 = JPY 107.871**

**AFN 1 = JPY 1.33**

**Source: JICA Monthly Exchange Rate in JFY 2019 July**



# Islamic Republic of Afghanistan



Map of Study Area





# DATA COLLECTION SURVEY ON IRRIGATION METHOD IN RURAL AREA OF AFGHANISTAN

## COMPLETION REPORT

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**Acronyms and Abbreviations**

CDP	:	Community Development Program
C/P	:	Counterpart Personnel
CTII	:	CTI Engineering International Co., Ltd.
FR	:	Final Report
FAO	:	Food and Agriculture Organization of the United Nations
GDP	:	Gross Domestic Product
HDI	:	Human Development Index
HYMEP	:	Project for Capacity Enhancement on Hydro-Meteorological Information Management
ICR	:	Inception Report
IRDP	:	Irrigation Restoration Development Project
JICA	:	Japan International Cooperation Agency
MAIL	:	Ministry of Agriculture, Irrigation and Livestock
MEW	:	Ministry of Energy and Water
MRRD	:	Ministry of Rural Rehabilitation and Development
ODA	:	Overseas Development Assistance
NGO	:	Non-Government Organizations
PMS	:	Peace (Japan) Medical Services
TOR	:	Terms of Reference
WRD	:	Water Resources Department in Ministry of Energy and Water

**Measurement Units**

(Length)		(Time)	
mm	: millimeter(s)	s, sec	: second(s)
cm	: centimeter(s)	min	: minute(s)
m	: meter(s)	h, hr	: hour(s)
km	: kilometer(s)	d, dy	: day(s)
		y, yr	: year(s)
(Area)		(Volume)	
mm <sup>2</sup>	: square millimeter(s)	cm <sup>3</sup>	: cubic centimeter (s)
cm <sup>2</sup>	: square centimeter(s)	m <sup>3</sup>	: cubic meter (s)
m <sup>2</sup>	: square meter(s)	l, ltr	: liter (s)
km <sup>2</sup>	: square kilometer(s)	MCM	: million cubic meter(s)
ha	: hectare(s)		
(Weight)		(Speed/Velocity)	
mg	: milligram	cm/s	: centimeter per second
g, gr	: gram(s)	m/s	: meter per second
kg	: kilogram(s)	km/h	: kilometer per hour
ton	: ton(s)		



## CHAPTER 1 OUTLINE OF THE STUDY

### 1.1 Background of the Study

Due to natural disasters and the repeated conflicts that lasted for more than 25 years, the Islamic Republic of Afghanistan (hereinafter referred to as "Afghanistan") is ranked as 168th<sup>1</sup> among the 189 countries listed in the Human Development Index (HDI), and it is also one of the poorest among the developing countries.

About 80 percent of the country's population is estimated to be engaged in agriculture in the rural areas. The rural environment is in a poor condition because of the destruction of rural infrastructure by the long-lasting hostilities and the natural disasters such as frequent droughts. Therefore, the rural residents are in a very severe situation of food insufficiency and so on.

The most severe drought since 2000 occurred in 2018. The drought caused about 260,000 internally displaced people in Mazar-e-Sharif of the northern region and Herat of the western region. The number exceeds the internally displaced people in the war between the Afghan government and Taliban of the antigovernment forces at that time. According to the United Nations, the population under food shortages is between 9 million and 13 million people (approximately 20 million as of May 2022).

In response to this situation, JICA supported the development and improvement of institutions and capacities, human resources, water resources management, rice cultivation practices, and the capacity for maintenance of irrigation facilities in the agricultural sector. JICA is in cooperation with the Peace (Japan) Medical Services or PMS, hereinafter referred to as the "PMS", an international non-government organization (NGO) supporting the development of irrigation facilities in the Nangarhar Province as the Community Development Program (hereinafter referred to as "CDP")<sup>2</sup> of the Afghan government. PMS has been providing support for the construction of irrigation facilities in the province.

The activities of PMS have contributed to the provision of irrigation facilities in the region. The project to improve irrigation facilities in Kama and Behsud districts in the province which was conducted in cooperation with JICA from 2010 to 2012, enriched the farmlands in the river basin (60-70% of the districts) with the construction of intake facilities in the Kabul River. In addition, PMS also provided support on the improvement of irrigation facilities in Kashkot in 2012-2014 and in Miran in 2014-2016, both of which are in the Kunar river basin where heavy flooding occurs frequently and in which the river is steep in comparison with the Kabul River. The construction of weirs and revetments has enabled stable irrigation in the Upper Kunar river basin and the Kunar river basin in Behsud district.

In response to these successes, President Ghani at that time directed the relevant ministers in 2018 to consider the restoration of irrigation facilities and the other facilities that had stopped operation due to the long conflicts, and to make a review and study on the plans and designs of existing irrigation facilities. The President further directed them to study the viability of the PMS method irrigation technique in rural areas of Afghanistan.

In response, CTI Engineering International Co., Ltd. (CTII), which was commissioned by the Japan International Cooperation Agency (JICA), the organization entrusted by the Japanese government to implement the Japanese Overseas Development Assistance (ODA) Program, conducted the "Data Collection Survey on Agriculture and Rural Development in Afghanistan" from 2017, to review and confirm the results of the PMS method irrigation technique for future project implementation. In addition to the results of the CDP project in Nangarhar Province, CTII also confirmed the status of water resources management and hydro-meteorological information in Afghanistan, the current status and challenges of

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<sup>1</sup> Human Development Report (UNDP, 2017)

<sup>2</sup> Community Development Program. This program will provide technical cooperation (top-down approach) to government ministries and agencies in Afghanistan to promote the Agricultural and Rural Development Program, which is Japan's priority support area. Individual projects that contribute to the integration of the goals and achievements of the program will be conducted in cooperation with NGOs that are well-versed in the needs of the site (bottom-up approach). This is a participatory community development project that aims to feed back the success stories and experiences (models) to the Afghan Government's policy, strategy, and national priority programs.



irrigation facilities and how to improve them, irrigation development policies and the efforts of other donor institutions such as the World Bank. The survey confirmed the technical viability and effectiveness of irrigation projects using the PMS method irrigation technique, thoroughly analyzed the irrigation and hydro-meteorological data for flow calculation and hydraulic design, and investigated the possibility of application of the method in basins other than the Kunar river basin in Afghanistan.

As confirmed from the results of the survey, the PMS method irrigation technique mainly utilizes a lot of boulders that are readily available in Afghanistan. This technique has the advantage in its ability to effectively demonstrate its functions at the time of floods and drought, as well as its ease of maintenance. The characteristics of intake facilities which are capable of stable intake during both flood and drought periods, river beds that are resistant to erosion by floods of a large river, and flood control and irrigation facilities that are easy for local residents to operate and maintain have enabled the supply of stable irrigation water to farmlands. It was also confirmed that the method has been contributing to the expansion of irrigated farmlands, improvement of crop productivity, and the improvement of farm and household incomes. In addition, it was confirmed that the functions are sufficiently effective in basins other than the Kunar river basin.

On the other hand, when the PMS method irrigation technique is planned to be adopted outside of the Kunar river basin, it is necessary to formulate and formalize the technique because there are technical items that should be properly planned and designed according to natural conditions such as meteorology, hydrology, topography, geology, etc., of a target river. In addition to the technical requirements for planning, design, construction management, and maintenance of irrigation projects, it is necessary to clarify the knowledge of PMS in line with local communities and project sites, such as project operations based on the social and cultural characteristics of the local communities.

The PMS method irrigation technique would contribute to efforts to combat drought and develop the agricultural infrastructure in Afghanistan. The PMS method irrigation technique if applied in other river basins would support sustainable and independent economic growth based on the JICA's plan for Afghanistan's development plans and strategies, and help reduce poverty and improve living conditions. It could also meet the point that emphasizes support to agricultural and rural development for more than 80 percent of the population and contributes about 30 percent of the Gross Domestic Product (GDP) (2010-2011, Afghanistan Statistical Yearbook).

In line with the results of the survey, JICA recognized the technical, economic, and social usefulness of the PMS method irrigation technique for agricultural and rural development in Afghanistan and it decided to develop a "PMS Method Irrigation Project Guidelines" for use in other PMS method irrigation projects targeting government officials and engineers who will be engaged in such projects. The references to Afghan government officials in this report refer to administrative officials prior to the political upheaval within Afghanistan on 15 August 2021.

In this report, irrigation projects that PMS has promoted so far are described as "PMS method irrigation projects," facilities constructed by PMS method irrigation projects are described as "PMS method irrigation facilities," and irrigation technique and maintenance management technique of PMS method irrigation projects are described as "PMS method irrigation technique" or "PMS method," but the project implementer is not limited to PMS in the future development of the project for dissemination.

## **1.2 Objectives of the Study**

The Study aims to formulate the "Irrigation Project Guideline" for the dissemination of irrigation technical methods and the operation of PMS method irrigation projects, taking the characteristics of rural communities in Afghanistan into account. The Study is based on the hydraulic characteristics of irrigation facilities and the results of rural and social survey conducted in the previous "Data Collection Survey on Agriculture and Rural Development in Afghanistan."



### 1.3 Contents of the Study

To achieve the above objective, the following was studied, and reports were prepared while exchanging opinions with JICA and related organizations through Japan's invitation and third country consultation:

- (1) Brochure for the Introduction of the PMS Method Irrigation Projects
- (2) PMS Method Irrigation Project Guidelines
- (3) Movie for the Introduction of the PMS Method Irrigation Projects
- (4) Proposal of Training Curriculum using PMS Method Irrigation Project Guidelines

In addition, a study on the dissemination of the PMS Method Irrigation Projects was conducted.

### 1.4 Study Area

Implementation location is Japan. Although the survey team had originally planned to hold meetings in a third country (assuming India), it was difficult to hold face-to-face meetings due to the Covid-19, and so the "PMS Method Irrigation Project Guidelines" were explained and discussed by online.

The main target area is the PMS Method Irrigation Projects area and the existing facilities such as intake facilities, irrigation canals and sand basins in the Kunar River in Nangarhar Province.

### 1.5 Relevant Organizations

The relevant organizations are as follows:

- (1) PMS [Peace (Japan) Medical Services]
- (2) MAIL (Ministry of Agriculture, Irrigation and Livestock)
- (3) MEW (Ministry of Energy and Water)
- (4) MRRD (Ministry of Rural Rehabilitation and Development)
- (5) FAO (Food and Agriculture Organization, United Nations)
- (6) Others

### 1.6 Study Schedule

The Study was carried out from September 2019 to March 2023 as shown in the following table.

**Table 1.6.1 Study Schedule, PMS Irrigation Project**

No.	Items	2019		2020				2021				2022	2023
		9	12	3	6	9	12	3	6	9	12	9	3
1	Brochure for the Introduction of the PMS Method Irrigation Projects	↔					↔		Japanese, English		Dari, Pashto		
2	PMS Method Irrigation Project Guidelines (including dissemination studies)	↔						Japanese	English		Dari, Pashto		
3	Movie for the Introduction of the PMS Method Irrigation Projects						↔	Japanese, English			Dari, Pashto		
4	Proposal of Training Curriculum using PMS Method Irrigation Project Guidelines											↔	*
5	Japan Invitation	*											
6	Remote Consultation (Explanation of the Guidelines)							*	*				
7	Discussion and Confirmation	*	*	*	*	*	*	*	*	*			*
8	Submission of Report	ICR											FR

Legend: ICR: Inception Report; FR: Final Report  
↔ Japanese ↔ translation to English, Dari, and Pashtu



## CHAPTER 2 BASIC UNDERSTANDINGS

### 2.1 Activities Related to PMS Method Irrigation Projects

The Peace (Japan) Medical Services or the PMS launched the “Green Ground Project” in 2003. This project is envisioned to ensure the irrigation of 16,500 hectares of farmlands as well as the livelihood of 650,000 people in the irrigation area by 2020. **Table 2.1.1** and **Figure 2.1.1** show the activities of the PMS method irrigation projects through 2017. So far, the targeted 16,500 hectares of irrigation area has been achieved.

In the PMS method irrigation projects, the developed irrigation area is not depend on advanced techniques as reconstruction projects after the prolonged conflicts in Afghanistan. The PMS method irrigation projects contribute to the reclamation of irrigation areas resulting in the generation of livelihood for the inhabitants. In addition, it converts arid lands into green lands by canal protection works using vegetation, and contribute to soil conservation for the alleviation of sandstorm damage. Such PMS method irrigation projects mainly with human power create quick impacts on farming, livelihood of surrounding residents and the environment.

In the “Data Collection Survey on Agriculture and Rural Development in Afghanistan” that is being conducted since 2017, the PMS method was hydraulically evaluated to function in the design flood and drought. The effects such as expansion of irrigation area and improvement of crop productivity were confirmed with the supply of stable irrigation water. Accordingly, its technical, economic, and social usefulness was confirmed.

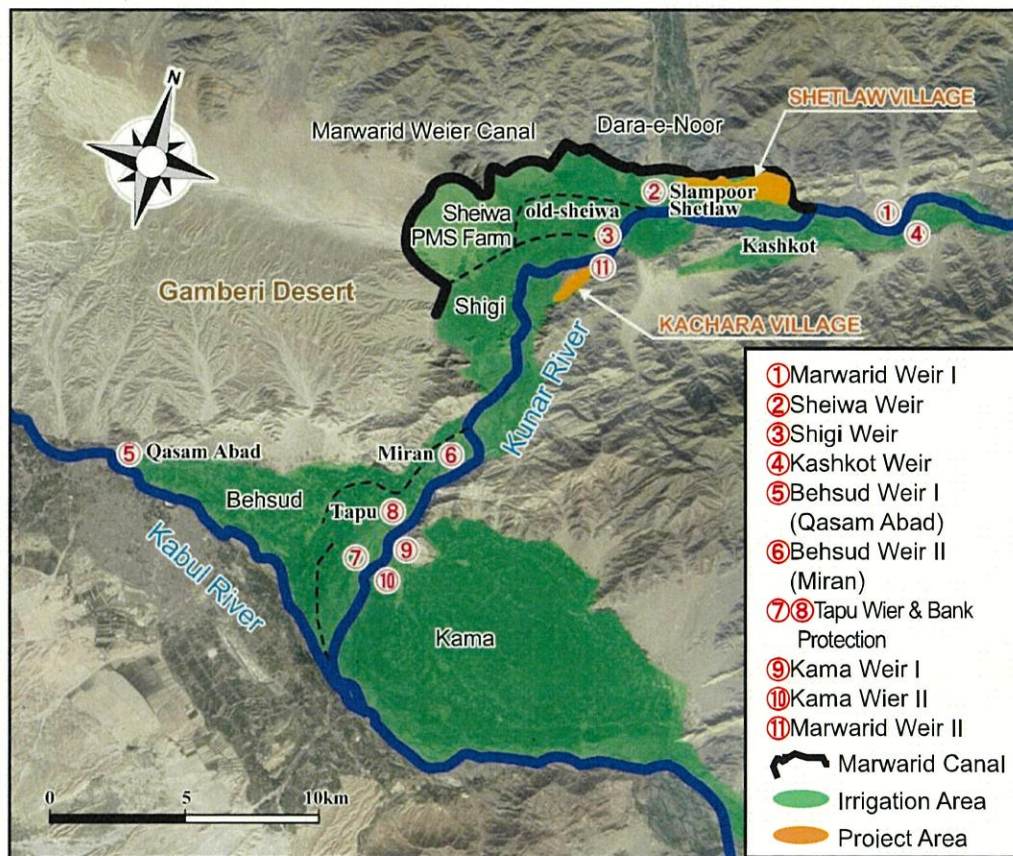
**Table 2.1.1 PMS Project Works (2003 to 2018)**

No.	Name	Construction Period	Project	Target Area	Irrigation Area (ha)
1	Marwarid Weir/Canal	2003-2010	Intake weir, intake gate, regulating pond, canal (25km), diversion canal, drainage canal, bank protection works (approximately 2km), reservoir, sand prevention forest, syphon, etc.	Sheiwa	3,000
2	Sheiwa Weir	2007-2008	Intake weir, intake gate, regulating pond, canal (360m)	Sheiwa	500
3	Shigi Weir	2014-2015	Intake weir, intake gate, regulating pond, canal (200m)	Sheiwa	600
④	Kashkot Weir	2012-2014	Intake weir, intake gate, regulating pond, canal (1,992m), regulating pond, bank protection works (4.0km)	Sheiwa	1,700
⑤	Behsud Weir I (Qasam Abad)	2011-2012	Intake weir, intake gate, regulating pond, canal (280m)	Behsud	2,500
⑥	Behsud Weir II (Miran)	2014-2016	Intake weir, intake gate, regulating pond, canal (400m), drainage canal (500m), bank protection works (2km)	Behsud	1,100 (1,600 after integration of Tapu)
⑦	Behsud Bank Protection Works	2010-2012	Embankment (3 km)	Behsud	500 (integrated to Miran in 2016)
8	Tapu Weir (abolition)	2010-2012	Intake weir, intake gate	Behsud	
9	Kama Weir I	2008-2010	Intake weir, intake gate	Kama	1,500
10	Kama Weir II	2010-2012 Reconstruction 2018	Intake weir, intake gate, regulating pond, canal (1,040m), bank protection works (500m)	Kama	5,500
⑪	Marwarid Weir II	2016-2018	Intake weir, intake gate, etc.	Sheiwa	800

Source: Peshawar-kai

Note: Red circles indicate JICA-PMS joint projects.





Source: Peshawar-kai

Figure 2.1.1 PMS Project Location Map

## 2.2 Details of PMS Method

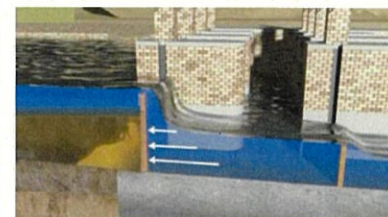
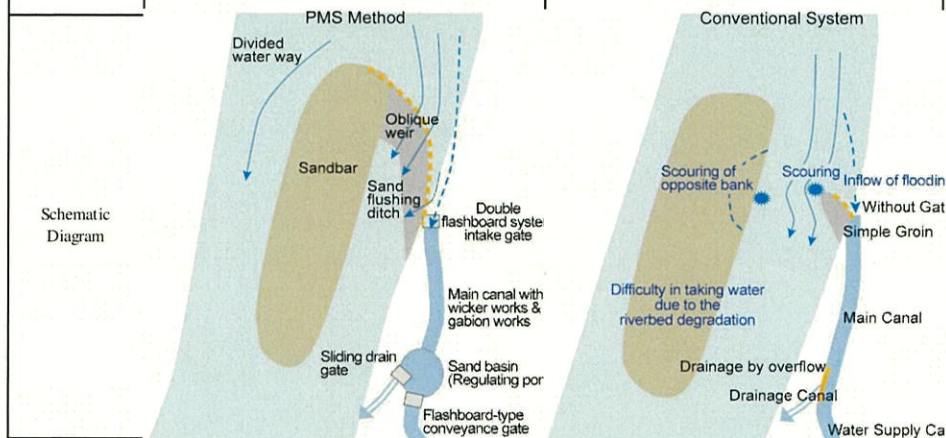
The PMS intake method has the features shown in **Table 2.2.1**. In comparison with the conventional intake system in Afghanistan, it is mainly based on the construction method that does not adversely influence nature without requiring advanced and expensive construction materials. The characteristic aspect of the PMS method is the weir installed in an oblique position. Although the weir materials are boulders, they can be easily procured locally, installation with a gentle gradient at the downstream portion of the weir makes the weir body stable, and a stable water intake becomes possible without collapse of the facilities.

It is, therefore, necessary to formalize the knowledge on the PMS method irrigation technique for the implementation of irrigation projects in local communities, such as the project management based on social and cultural characteristics of the local communities where the PMS method was so far implemented, in addition to the technical requirements for planning, designing, construction supervision, and maintenance of irrigation projects.



**Table 2.2.1 Comparison of Intake Methods**

Item	PMS Intake System	Conventional Intake System
Dam-up system	Oblique Weir	Simple Groyne
Structure of the Intake Mouth	Double Weir Sheet Pile Method	without the Intake Gate / with the Manually Sliding Sheet Type
Canal Bed Material near the Intake Facility	Soil Cement Lining	Simple Digging or Concrete Lining
Structure of the Irrigation Canal Wall	Gabion and Wicker Works	Same as the above
Storage Function	Install the Regulation Reservoir	None
Spillway and Drainage	Drain the Bottom Water through the Sliding Drain Gate installed at the Sand Basin	Overflow from a portion of the Main Canal Wall
Sedimentation Countermeasures	Combined with a Sand Flushing Ditch at the Intake Weir, and the Drainage Gate installed at the Sand Basin	None



- The intake facility adopts the double flashboard, which reduces the burden of water pressure applied to the weir by gradually lowering the water level when the water level is high (during flood).
- The sediment at the time of floods is accumulated on the bottom of the weir flashboard located in the front side (the side of the main river) so that the sediment does not accumulate in the canal.
- The sand flashing ditch (the lower water level canal) is placed in front of the intake which allows releasing the sediment to the main river.

Reference: FAO (Introduction to PMS Irrigation Intake Set, Peshawar-kai Newsletter and DVD)

#### **Effectiveness of the PMS Method**

- It can reduce the influence of river flow on the weir body. In addition, the conventional intake of the slide sheeting style has difficulty in operating gates when the water level of the river is high during the flood season. However, by adopting the double flashboard, it is possible to operate the flashboards with human power even when the water level is suddenly increased.
- For the bank protection of the canal that is connecting the intake to the irrigation area, gabions are installed that can be procured locally and restored easily when damaged. By combining with the willow works, the willow roots keep the binding condition between the stones, and play the role in replacing the iron wire even after the iron wire of the gabion has worn out.
- In the PMS method, a regulating reservoir is installed in the middle of the irrigation canal to prevent irrigation area from flooding and to settle the bed load sediment in the intake water. In addition, the flood flow is drained out through the drain gate that is connected to the regulating reservoir.

**Figure 2.2.1 Outline of PMS Method**

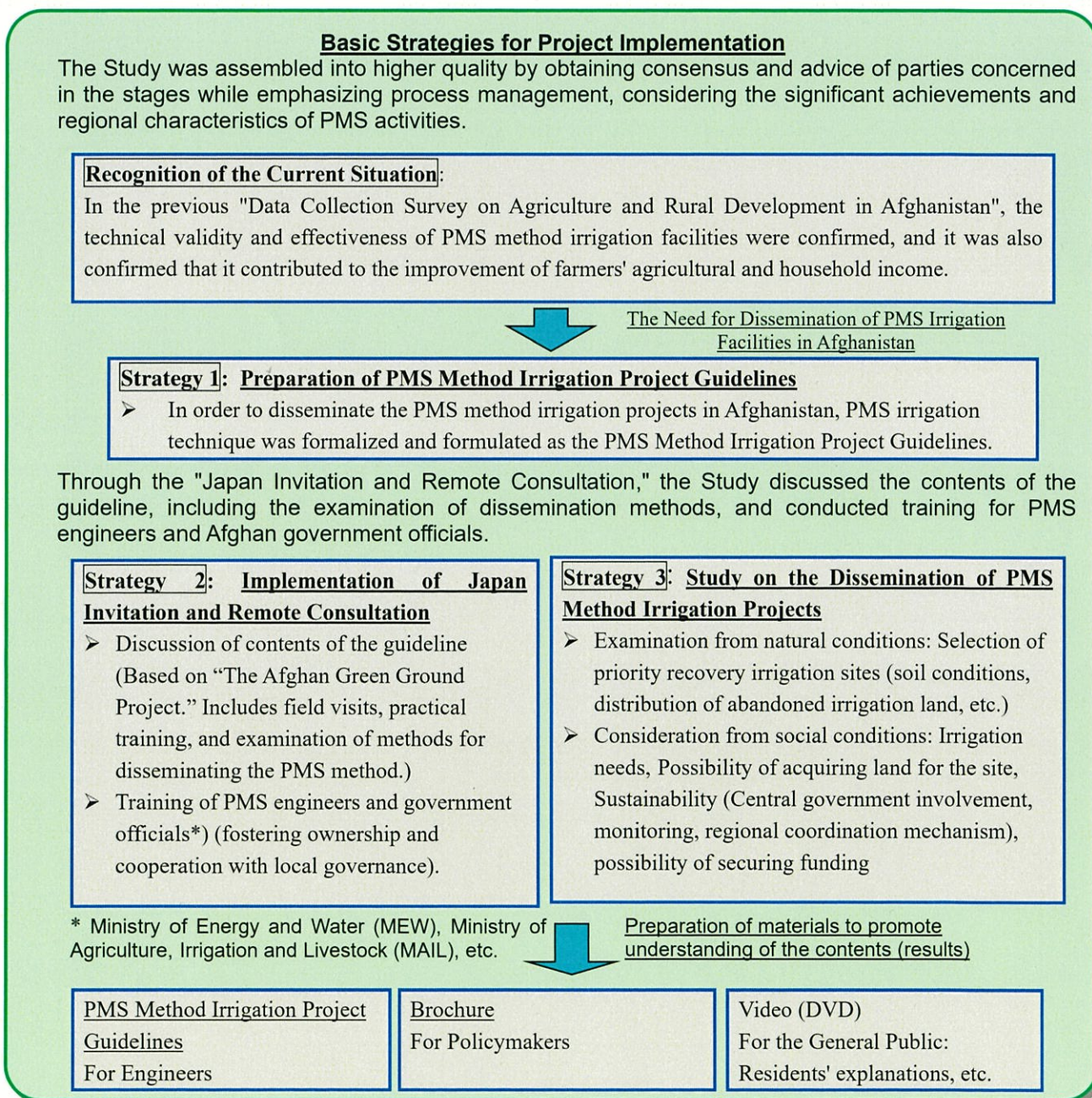


## CHAPTER 3 BASIC STRATEGIES FOR THE STUDY

### 3.1 Summary of Basic Strategies

**Figure 3.1.1** gives a summary of the basic strategies based on supposed study contents and outputs by referring to the Terms of Reference (TOR) and relevant information.

For the dissemination of irrigation project method promoted by Peace (Japan) Medical Services in Afghanistan, the Study prepared a guideline, discuss the guideline contents for dissemination, and formulate the dissemination plan by analyzing the natural and social conditions in Afghanistan. In consideration of this procedure, the Study is categorized as the preparation of guidelines, discussions in Japan and a third country, and analyses on the dissemination of PMS irrigation project methods.



**Figure 3.1.1 Objectives of the Study and Summary of Basic Strategies**



### 3.2 Preparation of PMS Method Irrigation Project Guidelines

The objective of the Guideline is to disseminate knowledge and technology on PMS method irrigation projects throughout the country. The Guideline is a holistic irrigation project guideline based on the essence of PMS activities considering rural social conditions. It is summarized for extending the contents of “The Afghan Green Ground Project” written by Dr. Tetsu Nakamura of Peshawar-kai<sup>3</sup>, based on interviews and analysis results of the previous project of “Data Collection Survey on Agriculture and Rural Development in Afghanistan” besides the book. It is possible to respond flexibly by relationships of cooperation through the previous project. The guideline describes the dissemination method of the PMS method irrigation projects to other areas with descriptions about irrigation plan, design, operation, and maintenance (operation and maintenance by monitoring and tolerating disruption of structure) considering natural and social conditions in Afghanistan based on the experience on PMS activities. The following figure shows considerations for preparation of the guideline.

- Considering the situation of Afghanistan, the figures/tables/graphs are used for easy understanding of the technique.
- Easily understood terms/words are used basically considering the situation. Terminology is unified to “The Afghan Green Ground Project,” and explained accordingly.
- The Guideline incorporates information in existing guidelines, and comparison of examples such as best and bad practices in the country to assist in the explanation and verification of the facility plan.
- The Guideline clarifies decent contents and contents that leave room for interpretation according to local situations. By deepening the mutual understanding of the guideline contents with relevant Afghan persons who will disseminate the Guideline in future, it will be possible to update it sustainably for future use.

**Figure 3.2.1 Considerations for Preparation of the Guideline**

The major outputs are the “Guideline,” Brochure” and “Video (DVD)” as shown below, which have proper contents based on the supposed users. These were translated into English, Dari, and Pashtu. Natives who have experiences and knowledge of water or civil engineering translated and checked the contents. They were selected considering publication in Peshawar-kai and experience on media such as videos.

**Table 3.2.1 Guideline and Preparation of Media for Dissemination**

	Guideline	Brochure	Video (DVD)
<b>Target Users</b>	<b>For Engineers</b> <ul style="list-style-type: none"> <li>Engineers in central government, regional government (MEW, MAIL, etc.)</li> <li>Engineers in design consulting firms, etc. in Afghanistan</li> </ul>	<b>For Policymakers</b> <ul style="list-style-type: none"> <li>Policymakers in central government, regional government</li> <li>Policymakers in international donors</li> </ul>	<b>For General Public</b> <ul style="list-style-type: none"> <li>Rural peasants, NGO members, Supporters</li> </ul>
<b>Considerations</b>	<ul style="list-style-type: none"> <li>Emphasizes practicability for users using a lot of figures/tables/graphs</li> <li>Use of easy expressions and terminologies as much as possible.</li> <li>Introduces comparison examples of other donors</li> </ul>	<ul style="list-style-type: none"> <li>Explains situations and consequences before and after PMS method irrigation projects in easily understood terms</li> <li>Explains the history and activity records of PMS</li> <li>Introduces contents of the Guideline in simple terms</li> </ul>	<ul style="list-style-type: none"> <li>Has a role of public relations for supporters of Peshawar-kai</li> <li>Is an awareness material for understanding the PMS method irrigation technique</li> </ul>

### 3.3 Implementation of Japan Invitation and Remote Consultation

PMS engineers and Afghan government officials (MEW, MAIL, etc., described above) were invited to Japan and the remote consultation meeting to promote understanding of the technical, social and dissemination of the PMS Irrigation Project methods. In order to cultivate ownership, they participated

<sup>3</sup> Peshawar-kai is an international NGO (NPO) organization formed in September 1983 to support Dr. Tetsu Nakamura's medical activities in Pakistan. PMS (abbreviated as Peace (Japan) Medical Services) is a local entity led by Dr. Tetsu Nakamura, President of Peace Medical Mission in Japan.



in the discussions about the guideline, and the preparation of the guideline proceeded with mutual agreement. In order to disseminate and expand the PMS Irrigation Project methods, it is important to establish maintenance awareness and methods in the concerned local communities through cooperation between the central government and local government units based on the social customs and systems unique to Afghanistan. The invitation programs assumed explanation and discussion of the PMS Method Irrigation Project Guidelines, practical training for dissemination of the PMS Irrigation Project methods, and field trips to related facilities. The target users are the PMS engineers, MEW, MAIL, and other government officials, and the location was planned in Asakura City, Fukuoka Prefecture, where Yamada Weir is located and deeply related to the PMS.

### 3.3.1 Explanation and Discussion on PMS Method Irrigation Project Guidelines

Opinions were exchanged to create the PMS Method Irrigation Project Guidelines and promoted understanding of the PMS Irrigation Project Methods.

- (1) Case studies from other countries were introduced such as upstream/downstream and left/right bank coordination mechanisms, river channel planning, etc., at the community level from the watershed perspective.
- (2) Understanding of the benefits of PMS method irrigation facilities and the layout plans for irrigation and flood control facilities. Stability calculation methods for structures were also be explained.
- (3) In order to understand the actual facilities, participants visited the intake weir and irrigation canal sites. In addition, explanations on construction management, etc. were provided.
- (4) The contents of lectures and practical training were fully understandable by the study participants, and make sure that they keep in close contact with the relevant people after they return to their country to deepen their understanding on the PMS method. In addition, the guidelines were finalized based on stakeholder input obtained during the explanations and discussions.

### 3.3.2 Field Practices and Field Trips for Dissemination of PMS Irrigation Project Methods

From the results of the rural and social survey conducted in the previous study, "Data Collection Survey on Agriculture and Rural Development," it became clear that the most important issue is, that the yield of crops excluding wheat is lower than the average yield in Nangarhar Province.

Invited to Japan, lectures, field training, and related facility tours were held for the improvement of low yield and the contents proposed by PMS staffs. The contents of the training were as follows:

- (1) Verification whether the contents of training in the previous survey (Data Collection Survey on Agriculture and Rural Development) was properly implemented
- (2) Irrigation methods and ridging at distal ends to prevent root rot due to excessive irrigation (explanation and discussion of current technical problems, improvement methods, etc.)
- (3) Technical methods to make up for the lack of use of expensive agricultural materials (how to identify nutrient deficiencies, crop rotation for disease prevention, intercropping to prevent insect damage, etc.)
- (4) Explanation for basic knowledge of calcareous soils in Afghanistan and fertilization techniques to improve crop productivity under these soils
- (5) Field boundary survey, topographic survey for water diversion, etc.





**Figure 3.3.1 Death and Uneven Growth due to Excessive Irrigation**

### 3.4 Analysis on Dissemination of PMS Irrigation Project Methods

The Green Ground Project of PMS targets 2020, and a dissemination plan after that is necessary. The study proposed a plan for dissemination. Based on the following considerations from the natural and social conditions in the guideline preparation stage, a plan for dissemination was formulated with JICA, PMS, and government officials.

In addition, by examining the applicability to the priority basin on the desktop analysis using the following information and data, a general analysis on the form of facilities was conducted when PMS method irrigation facilities are applied to other basins.

- Results of the “Enhancing Agriculture Production through Irrigation System Improvement and Strengthening Institutional Capacity” project, which is a grant agreement between JICA and the United Nations Food and Agriculture Organization (FAO) (construction of training building and curriculum for dissemination, etc.)
- Hydro-Meteorological data of WRD assisted by JICA-HYMEP (explained the situation to WRD and obtain data)
- Global data, results of JICA’s “Data Collection Survey on Agriculture and Rural Development” and FAO “Irrigation Restoration Development Project (IRDP),” etc.
- Collection and summary of local information by interviews with government officials and by hired local staff

**Figure 3.4.1 Information and Data used for Dissemination Study**

As for the circumstances of the PMS Method Irrigation Projects in Afghanistan, President at that time Ashraf Ghani awarded a medal to Dr. Tetsu Nakamura and instructed the relevant ministries to acquire PMS irrigation technical methods. In Afghanistan, an election was scheduled for September 2019, so it was necessary to watch the situation.

#### 3.4.1 Examination of Natural Conditions

The arable land in Afghanistan fell from 2.59 million hectares in the 1980’s to 1.75 million hectares in 2002. It is said that this is because irrigation facilities were damaged or deteriorated due to droughts and floods since 1999, and abandoned farmlands increased. This abandoned cultivated land could be suitable for cultivation of crops. After that, restoration of irrigated land was listed as an important measure in the national irrigation policy (National Comprehensive Agriculture Development Priority Program 2016-2020), and cultivatable land recovered to 2.27 million hectares in 2018. In selecting the priority restoration irrigation area, the remaining abandoned farmlands are candidates. Other selection conditions include the following:

- (1) Possibility of procurement of construction materials
- (2) Water intake conditions (river characteristics, water volume, etc.)
- (3) Water conveyance conditions (geology, etc.)
- (4) Farmland conditions (soil conditions)



Based on this content, a selection method that is more suitable for the current situation in Afghanistan was proposed in the guideline discussion with PMS staffs and related people.

### 3.4.2 Examination of Social Conditions

In order to establish and sustain the dissemination method, it is important to have a “thick and deep description of the region and water” in the guideline that matches the local method. With this in mind, local social surveys were conducted by local people, and the dissemination method and applicability were examined from the results. The following five (5) main items were surveyed:

- (1) Residents' agreement and land expropriation
- (2) Approval procedures for irrigation projects
- (3) Funding mechanism
- (4) River channel planning, water rights and monitoring mechanism
- (5) Community level adjustment mechanism for upstream/downstream and left/right banks

Based on the results, in order to ensure the sustainability of an irrigation project, the operation and maintenance and funding system were examined in consideration of the demands and independence of local communities and the impact of conflicts. It also took into consideration the cooperation from local government officials and funding from local diasporas (people who have left their hometowns).

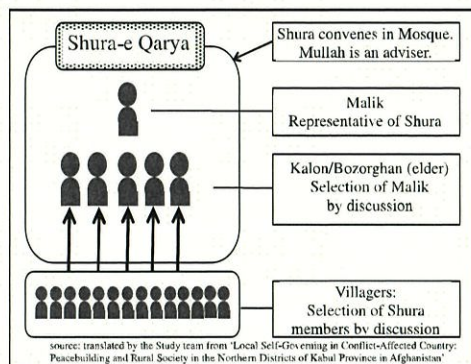


Figure 3.4.2 Discussion by Villagers



## CHAPTER 4 PLAN OF OPERATION

Based on the basic strategies mentioned above, the specific implementation method to achieve the results of the Study is described below.

### 4.1 Review and Analysis of Past PMS Activities

Prior to the field survey, the accomplishments of the past PMS method irrigation projects were reviewed and analyzed. By reviewing existing materials such as JICA-related surveys, surveys of other donors, Peshawar-kai newsletters, etc., the knowledge on the dissemination of PMS methods was summarized.

### 4.2 Consultation with Related Organizations

The main scheduled time, location, and purpose of the schedule are shown in **Table 4.2.1** below. Invitations to Japan and remote consultations, which are meetings for direct consultations with the relevant organizations, were scheduled. Consultations on guideline, pamphlets and videos were conducted with JICA and Peshawar-kai. The contents of the guideline were confirmed with PMS staffs and government officials at the remote consultation meeting.

**Table 4.2.1 Consultation Periods and Contents with Related Organizations**

Time	Discussion Type	Contents	Location	JICA	Peshawar-kai	PMS, Government
Sep-2019	Japan Invitation (Fukuoka)	Prior Consultation on Work Plan	Japan	●		
		Work Plan Consultation	Japan	●	●	●
		First policy discussion on videos, brochures, and guidelines	Japan	●	●	●
Nov-2019	Face-to-face meeting (Fukuoka)	Second policy discussion on brochure and guidelines	Japan	●	●	
Jan-2020	Face-to-face meeting (Fukuoka)	Third policy discussion on brochure and guidelines	Japan	●	●	
Feb-2020	Face-to-face meeting (Fukuoka)	Discussion on the framework for writing the guidelines	Japan	●	●	
Aug-2020	Remote meeting	Guideline Writing Content Consultation (Chapters 1, 2, 3, and 4)	Japan	●	●	
Sep-2020	Remote meeting	Guideline Writing Content Consultation (Chapters 5, 6, 7, and 8)	Japan	●	●	
Oct-2020	Remote meeting	Review of guidelines (Chapters 3, 4, 5, 6)	Japan	●	●	
Nov-2020	Face-to-face meeting (Fukuoka)	Review of guidelines (Chapters 1, 2, 7, 8)	Japan	●	●	
Dec-2020	Remote meeting	1st and 2nd round of discussions on video editing	Japan	●	●	
Jan-2021	Remote meeting	3rd round of discussions on video editing	Japan	●	●	
Mar-2021	Remote Consultation	Explanation of the contents of the guidelines to Afghan government officials	Japan	●	●	●
Apr-2021	Remote Consultation	Explanation of the contents of the guidelines to Afghan government officials (Explanation on improvement of agricultural technology)	Japan	●	●	●
Oct-2022	Remote meeting	Discussion on training curricula using the PMS Guidelines.	Japan	●	●	

### 4.3 Collaboration and Information Collection for Guideline Preparation

For the guideline, the necessary data and collected information are shown in **Table 4.3.1**. In addition, FAO has developed a curriculum for dissemination, and it is important to collaborate with this in examining the dissemination method in the Study. The correlation diagram among the agencies and related projects is shown in **Figure 4.3.1**.

**Table 4.3.1 Main Items of Collected Data and Collection Methods**

Items	Collected Information	Information Collection Method
Hydro-Meteorology	➤ Nationwide hydro-meteorological information (including JICA, HYMEP products)	MEW-WRD
Irrigation Facilities	➤ Guidelines information prepared by other donors such as FAO, construction facilities (design books), geological maps, etc. ➤ Internet information (Google Earth, DEM data)	Existing materials, discussions with PMS members and Afghan government officials, information gathered by local staffs
Agricultural Development	➤ Soil map, irrigated farmland map (distribution of irrigated land), soil characteristics in Afghanistan, consumption trends of agricultural products	



Items	Collected Information	Information Collection Method
	➤ Information on JICA-FAO project (construction of training building in Nangarhar and development of extension curriculum)	
Social Survey	➤ Residents' agreement and land expropriation ➤ Irrigation project approval procedures ➤ Funding mechanism ➤ River channel planning, water rights and monitoring mechanism ➤ Community level adjustment mechanism for upstream / downstream / left and right banks ➤ Society and culture in Afghanistan (customs and institution unique to local communities) ➤ Contents that contribute to the establishment of awareness of maintenance and ownership development	

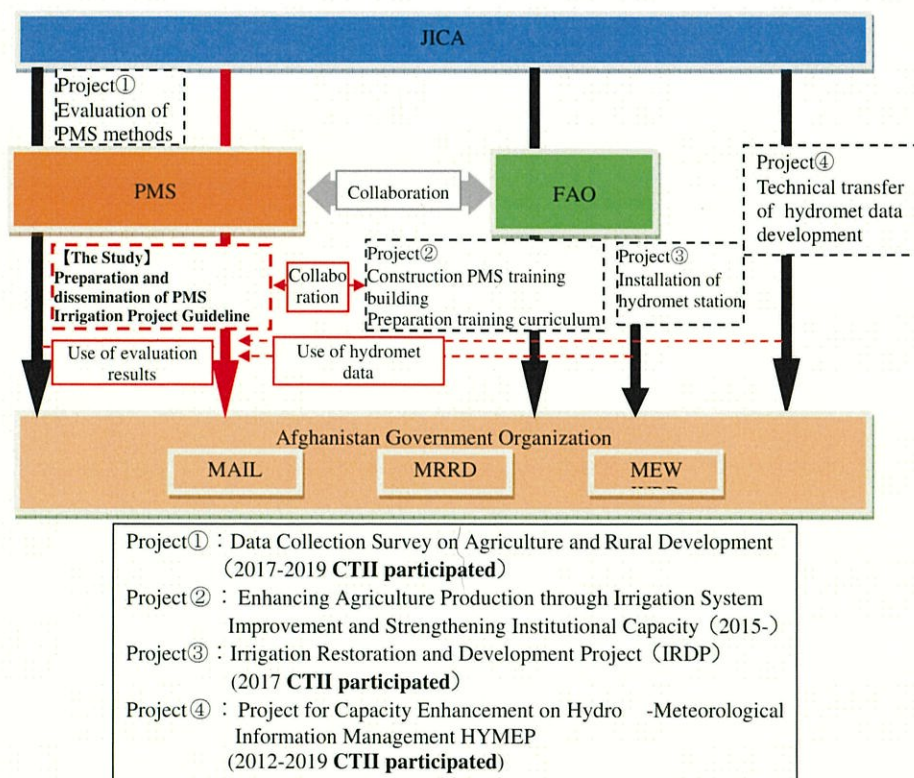


Figure 4.3.1 Correlation Diagram of Related Projects

#### 4.4 Preparation of “PMS Method Irrigation Project Guidelines”

The contents and specific items for the guideline are supposed to be the following.

Table 4.4.1 Contents and Specific Items in the Guideline

Items	General Contents	Specific Contents
1. Introduction	Background, objectives, contents of the Guideline	➤ Contents that maintain the purpose and aim of the guideline ➤ Clarification of usage of the guideline
	Application of the Guideline: Supposed target users, Restoration projects, New projects	
2. Basic Concept of Irrigation	Selection of PMS Method Irrigation Project Target Area	➤ Selection considering distance to water sources, soil conditions, etc.



Items	General Contents	Specific Contents
Project and Collaboration with Beneficiary Community		➤ Selection considering community needs, social conditions
	Discussion with Beneficiary Farmers in the PMS Method Irrigation Project Target Area	➤ Methods of community structure and consultation
	Preparation of Basic Concept of Irrigation Project and Basic Agreement with Beneficiary Farmers	➤ Water right, irrigation project approval process, water source river channel planning, etc.
	Land Expropriation Procedures and Request for Cooperation to Residents	➤ Consensus building methods according to social customs and institution unique to Afghanistan
	Evaluation of Impact on Other Areas by Irrigation Project Implementation and Mitigation Measures	➤ Necessary contents and coordination methods for upstream and downstream / left and right banks
	Procedures and Coordination on Irrigation Project Implementation and Operation and Maintenance	➤ Methods of coordination and procedure according to social customs and institution unique to Afghanistan
	Basic Civil Engineering Technique of PMS Method Irrigation Projects to be acquired by Beneficiary Farmers	➤ Explanation of civil engineering technique necessary to maintenance by farmers
3. Understanding of River Conditions	Understanding of Conditions of River Basin and Surrounding Area	➤ Main rivers in Afghanistan are roughly less than 10m <sup>3</sup> /s and huge sediment deposition different from the Kunar River in the PMS target site. Irrigation is mainly for wheat. ➤ Utilization of outputs from HYMEP which assisted information collection and analysis of hydromet monitoring stations in Afghanistan. ➤ Description of coordination mechanism of the upstream/downstream and left/right bank and river channel plans at the community level from a basin perspective. Description of matters of concerns when ethnicity and religion are different.
	Understanding of River Flow Conditions	
	Understanding and Monitoring of River Channel Conditions: including Topographical Survey	
4. Plan and Design of Irrigation Facilities Location	Objectives of Plan	➤ Development policy, development level, schedule setting
	Plan of Irrigation Beneficiary Areas	➤ Understanding of community needs, setting beneficiary target regions and areas
	Plan of Irrigation Beneficiary Areas (estimation of required irrigation water)	➤ Adapting the previous PMS field cropping pattern for irrigation water calculation
	Irrigation Weir, Intake Gate, Irrigation Canal and Drainage Canal, Sand Basin (Regulation Pond)	➤ Installation position, route, plane, and vertical cross section shape, etc.
	Design of Intake Weir (Boulder Oblique Weir)	➤ Design of cross section shape of weir from setting of design flow velocity and stability examination of weir body, setting of appropriate stone diameter, etc.
	Design of Sand Flushing Gate of Intake Weir	➤ Setting of the number of gates, gate width and canal gradient from the target sediment particle size
	Design of Intake Gate (Double Flashboard Type)	➤ Setting the number of gates, gate width, intake gate height from HWL ➤ Rules for operating the flush board to take in the required irrigation water
	Design of Irrigation Canal	➤ Setting of canal cross section for flowing required irrigation water ➤ Setting of specifications such as canal gradient, protection, canal lining



Items	General Contents	Specific Contents
	Design of Sand Basin (Regulation Pond)	<ul style="list-style-type: none"> <li>➤ Setting of sand basin size (dimensions), specification of sand drain gate</li> <li>➤ Setting of frequency of maintenance (dredging) of sand basin</li> </ul>
	Design of Drainage Canal	<ul style="list-style-type: none"> <li>➤ Setting of target discharge, canal cross section and gradient</li> </ul>
5. Plan and Design of Flood Control Works	Flood Control Works such as Embankment and Spur Dike	<ul style="list-style-type: none"> <li>➤ Embankment arrangement, alignment setting, foot protection spur dike arrangement</li> </ul>
	Design of Embankment	<ul style="list-style-type: none"> <li>➤ Setting of flood level and embankment specifications (height, crown width, embankment width, etc.)</li> </ul>
	Design of Stone Spur Dike	<ul style="list-style-type: none"> <li>➤ Installation purpose, type (pervious/impervious, overflow / non-overflow), specifications (length, width, height, installation interval, angle)</li> </ul>
6. Construction and Construction Supervision of the PMS Method Irrigation Projects		<ul style="list-style-type: none"> <li>➤ Construction planning, construction process management, quality control, cost control</li> </ul>
7. Operation and Maintenance of PMS Method Irrigation Facilities by the Residents	Operation and Maintenance of Facilities	<ul style="list-style-type: none"> <li>➤ Facility status monitoring for repair, operation of intake gate, sand flushing gate, sand drain gate, dredging of sand basin</li> </ul>
	Maintenance of Farmlands by Residents Countermeasures for Land Degradation	<ul style="list-style-type: none"> <li>➤ Symptoms of salt damage (symptoms of salt damage to crops, etc.), over-irrigation (symptoms of root rot, etc.)</li> </ul>
8. Improvement of Irrigated Agricultural Technology	Field Water Management Techniques	<ul style="list-style-type: none"> <li>➤ Water management techniques to prevent moisture damage and improve crop productivity</li> </ul>
	Farming Techniques	<ul style="list-style-type: none"> <li>➤ Effective technologies that enable sustainable and locally feasible crop cultivation to improve crop productivity</li> </ul>
	Soil Improvement Technology	<ul style="list-style-type: none"> <li>➤ Soils characterized by sandy and high pH, such as those in the study area, are fragile and difficult to manage, so soil improvement techniques are shown</li> </ul>

#### 4.5 Preparation of “PMS Method Irrigation Project Brochure”

The “PMS Method Irrigation Project Brochure” introduces the PMS activities and the guideline briefly. Before preparing the first draft of the Guideline, the layout of the Brochure (composition of text, photos, illustrations, tables, etc.) was studied and made a decision in consultation with JICA and Afghan related stakeholders. As for the brochure structure, it is that the “PMS past activity results, impact on situations by comparison before and after PMS method irrigation projects, PMS history (trajectory)” are introduced in the digest, and the main points of the guideline are introduced in the second half. The brochure preparation was subcontracted in Japan to publishers with experiences in publishing the “The Afghanistan Green Ground Project,” etc.

#### 4.6 Preparation of “PMS Method Irrigation Project Introduction Video”

In preparing the video, first, based on the information in the brochure, the video composition draft and storyboard (composition, image movement, time, dialogue) were made for each cut. After that, CG images, music, and narration were mixed in accordance with the storyboard, creating a preview movie, proofreading, and finishing to the final video.

The composition of the video was based on the contents of the brochure and arranged according to the expected audience (including local farmers). Detailed design and layout were decided in consultation with JICA and Afghan related stakeholders. Production of the abovesaid video was subcontracted in Japan to a production company with experiences in PMS video production.



## 4.7 Preparation and Submission of Deliverables

The deliverables shown in **Table 4.7.1** were submitted to JICA and related organizations at each stage of the Study.

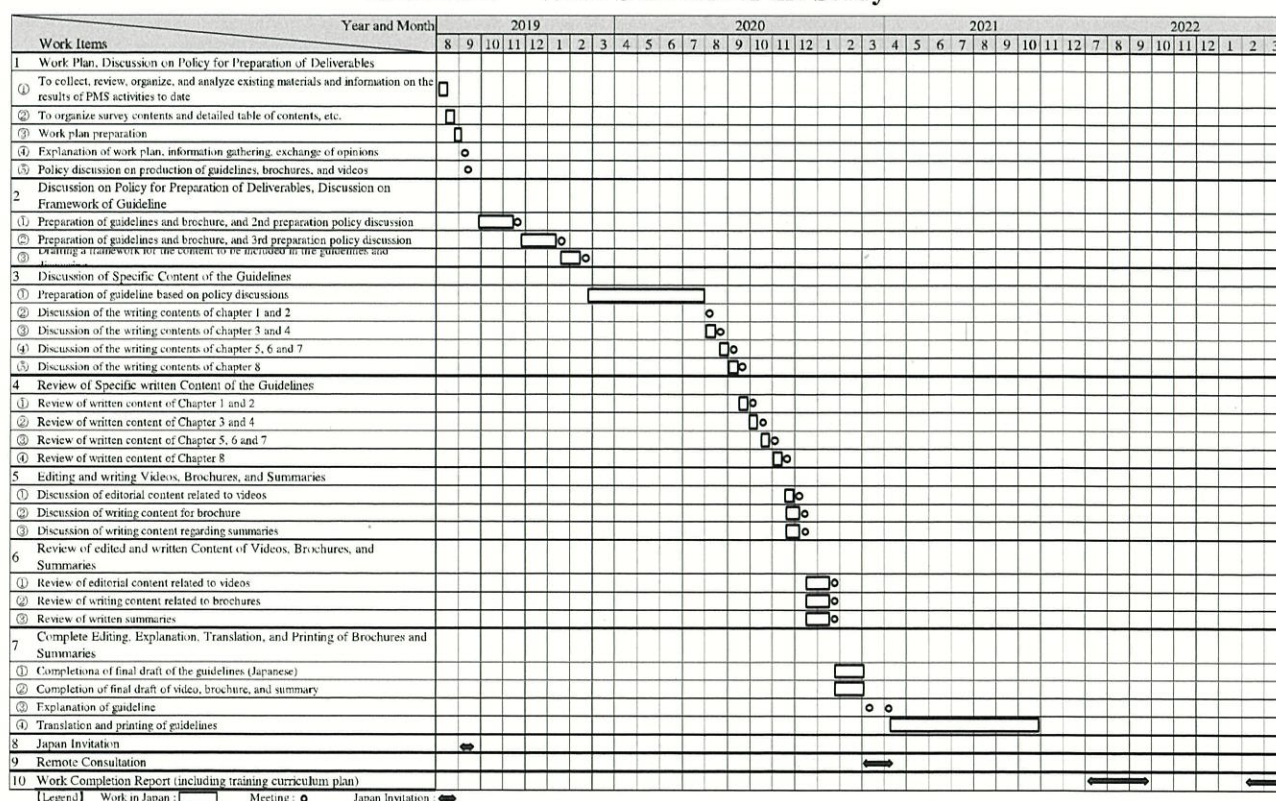
**Table 4.7.1 Deliverables and Number of Copies Submitted to JICA**

	Deliverables	Submission Time	Number of Copies
1	Inception Report	2 weeks after contracted	Japanese 6 sets, English 6 sets
2	Final Report (Includes proposed training curriculum)	1 month before completion	Japanese 6 sets, English 6 sets
3	PMS Method Irrigation Project Guidelines	30-June-2021 30-June-2021 29-October-2021	Japanese 20 sets English 50sets Dari, Pashto 50 sets Electric data 100 sets
4	PMS Method Irrigation Project Brochure	30-June-2021 30-June-2021 29-October-2021	Japanese 150 sets English 100sets Dari, Pashto 50 sets Electric data 50 sets
5	PMS Method Irrigation Project Video	30-June-2021	DVD 300 sets (language selection, Japanese, English, Dari, Pashto) Electric data 100 sets
6	Training curriculum	31-March-2023	Japanese 6 sets English 6 sets

## 4.8 Work Schedule

The work contents shown in the TOR were executed based on the work schedule shown in **Table 4.8.1**.

**Table 4.8.1 Work Schedule of the Study**



## 4.9 Implementation Structure

### 4.9.1 Personnel Assignment Plan

Table 4.9.1 shows the personnel assignment result.

**Table 4.9.1 Assignment Plan for the Study**

Position	Name	Affiliation	Rank	MM
Project Manager/River and Irrigation Project/Social Survey	Masakazu Miyagi	CTII	2	7.25
	Hideki Konno	CTII	2	0.50
Deputy Project Manager/Water Resources Management	Hideki Konno	CTII	3	5.55
Rural Development	Michiaki Hosono	CTII (contracted)	3	4.70
Social Survey	Masakazu Miyagi	CTII	4	1.00
Total				19.00



## CHAPTER 5 ACTUAL ACTIVITIES

### 5.1 Preparation of PMS Method Irrigation Project Guidelines

#### 5.1.1 Collection and Review of Existing Information

Before preparing guidelines, the following information was collected. As shown in **Table 5.1.1**, the scope of data collection ranges from Hydro Meteorology to Irrigation Facilities, Agricultural Development and Social Survey. These data underly the essence and features of successful PMS method irrigation projects.

Major information sources are shown as follows:

**Table 5.1.1 Information Sources for Guideline Preparation**

No.	Data source	Contents
1	Report from Dr. Nakamura (via the Peshawar-kai website)	Residents' agreement and land expropriation, approval procedures for irrigation projects, funding mechanism, river channel planning, water rights and monitoring mechanism, community level adjustment mechanism for upstream/downstream and left/right banks, society, and culture in Afghanistan (customs and institution unique to local communities) and contents that help establish awareness of maintenance and ownership development
2	JICA and the Project for Capacity Enhancement on Hydro-Meteorological Information Management (HYMEP)	Nationwide hydro-meteorological information
3	PMS method irrigation guidelines prepared by FAO	Specifications/capacities and design books of facilities constructed by other donors
4	FAO's agriculture-related projects	Information on the training building construction in Nangarhar and development of dissemination curriculum
5	Internet information	Google Earth, DEM data
6	Information gathered by local staff	Information (specifications) of facilities to be compared, information related to the essence and features of successful PMS method irrigation projects which is relevant to item No. 1 as above, natural conditions of the Kunar river basin and social conditions and other basic information
7	Others	Geological map, soil map, irrigated farmland map (distribution of irrigated land), soil characteristics in Afghanistan, consumption trends of agricultural products

#### 5.1.2 Preparation Policy of PMS Method Irrigation Project Guidelines

PMS Method Irrigation Project Guidelines shall be prepared under the following policies:

- Describe the premise that the guidelines compile knowledge on irrigation projects implemented in the Kunar river basin by PMS.
- The following are clearly explained in the preface of the guidelines: 1) PMS is a method applied to the eastern region of Afghanistan (Kunar river basin); 2) the explanation should be divided into "restrictions" and "general items"; 3) emphasizing the importance of continuous efforts; and, 4) highlighting the importance and need for "determination and arrangement of commitment" by the community and government officials.
- The PMS Method Irrigation Project Guidelines indicates the technical features and advantages of PMS method irrigation projects applicable in Afghanistan as well as the basic policy of community-oriented and sustainable maintenance and management.
- The guidelines should indicate that the PMS method irrigation techniques are local technology, but applicable to areas with different river slopes and natural conditions only by changing some facility specifications. In other words, the guidelines should indicate standard specification items for



structures of the PMS method irrigation techniques which are unaffected by rivers and regions as well as particular specification items to be considered in accordance with river and regional natural conditions and describe how to plan and design each item to design a PMS method irrigation facility in various regions.

- The PMS Method Irrigation Guidelines should be composed of two parts: the guideline part indicates the policy and consciousness of irrigation projects while the other part describes the technical planning and design methods.
- Expected guideline users include engineers and decision-makers (senior government officials, donors, etc.). The guideline should be a reference for local engineers when they seek to apply the PMS method irrigation techniques.
- The guidelines should be comprehensive, covering the basic concept, planning, design, and other relevant contents.
- The guidelines shall compile as much conventional experience, knowledge, and lessons as possible. Inserting this information in column and other styles should also be considered.
- The guidelines should mention that a PMS method irrigation project takes environmental and social conditions into consideration.

## 5.2 Preparation Policy for PMS Method Irrigation Project Pamphlets and Videos

Promotional pamphlets and videos of the PMS Method Irrigation Project Guidelines were created under the following policies:

- Describe the comparative advantage of PMS method irrigation projects by comparing with past projects implemented by other donors.
- Clarify the roles of farmers (residents) and policy-makers in maintenance and management.
- Pamphlets should mainly aim to inspire readers to promote the application of PMS method irrigation techniques.
- Pamphlets include a strong message highlighting the fact that the PMS method irrigation project will help solve difficult situations (water shortages). It was also considered to include a message emphasized by Dr. Nakamura, “three meals every day with family in the hometown.” A message of securing agriculture and livelihood without water shortages year-round” was included.
- Pamphlets should not only explain the advantages of PMS method irrigation projects but also describe the process and residents’ responsibility. They also describe unstable livelihoods and difficulties of workers (farmers).
- Insert photos of the site before and after a PMS method irrigation project was implemented to show how the situation improved.
- Give only an outline of the technical explanation of PMS method irrigation projects.
- Describe the result of PMS method irrigation projects and put feedback from farmers to show the reality. Insert animation and CG expressions and include technical contents. Show the fact by delivering a message of “No water, no food, but such situations can be improved by PMS method irrigation projects.”

## 5.3 Discussion on the Guideline Preparation

Based on the policies mentioned in previous sections, the PMS method irrigation project guideline, pamphlet, and video preparations were discussed as follows:



Method: face-to-face discussions at the Peshawar-kai office (Fukuoka City, Fukuoka Prefecture) and online discussions

Period: September 2019 to April 2021 (detailed contents by period are as follows:)

- September 2019 to January 2020 On preparation policy for guideline, pamphlet, and video preparation
- January 2020 to February 2020 On the outline of guidelines (descriptive contents)
- February 2020 to August 2020 Guideline preparation
- August 2020 to October 2020 Examination and discussion on written contents
- October 2020 to November 2020 Proofreading of written contents
- November 2020 to December 2020 Examination and discussion on the content of pamphlets and videos
- December 2020 to January 2021 Proofreading of pamphlets and videos
- January 2021 to April 2021 Explanation of the contents to Afghan government personnel

Discussion contents: **Table 5.3.1** describes discussion contents for PMS method irrigation guidelines, pamphlet, and video preparation.

**Table 5.3.1 Discussion on Guideline Preparation**

Date	Discussion contents	Venue
September 11 to 12, 2019	On guideline preparation policy On pamphlet and video preparation policy	Asakura City, Fukuoka
November 17, 2019	Presented first draft pamphlet and guidelines and conducted the second discussion on their preparation policy	Peshawar-kai office (Fukuoka City, Fukuoka)
January 12, 2020	The third discussion on pamphlet and guideline preparation policy	Peshawar-kai office (Fukuoka City, Fukuoka)
February 17 to 18, 2020	By completing the outline compiling guideline contents, confirmed and understood descriptive contents. Table of contents is as follows: Chapter 1 What are the “PMS method irrigation project guidelines”? Chapter 2 How should a PMS method irrigation project be launched together with farmers? Chapter 3 How should water source rivers be understood? Chapter 4 How should irrigation facilities be planned and designed? Chapter 5 How should flood control facilities be planned and designed? Chapter 6 How should PMS method irrigation facilities be constructed? Chapter 7 How should operation and maintenance of PMS method irrigation facilities be implemented? Chapter 8 How should agriculture and irrigation technology be improved? Written contents of each chapter were discussed.	Peshawar-kai office (Fukuoka City, Fukuoka)
August 1, 2020	On the written contents of Chapters 1 and 2 On video preparation schedule	Online meeting
August 22, 2020	On the written contents of Chapters 3 and 4	Online meeting
September 5, 2020	On the written contents of Chapters 6 and 7	Online meeting
September 18, 2020	On the written contents of Chapter 8	Online meeting
October 6, 2020	Proofreading of Chapter 4	Online meeting
October 13, 2020	On the written contents of Chapter 8	Online meeting
October 19, 2020	Proofreading of Chapters 3 and 6	Online meeting
November 21, 2020	Proofreading of Chapters 1, 2 and 7	Peshawar-kai office (Fukuoka City, Fukuoka)

Date	Discussion contents	Venue
		Fukuoka) and online meeting
December 2, 2020	On editorial matters for the first draft video	Online meeting
December 11, 2020	On editorial matters for the second draft video On editorial matters for the second draft pamphlet	Online meeting
January 31, 2021	Proofreading of the third draft video Proofreading of the third draft pamphlet Proofreading of the summary of guidelines	Online meeting
March 10, 2021	Explained guideline contents to Afghan governmental personnel	Online meeting
April 6, 2021	Explained guideline contents to Afghan governmental personnel (mainly on Chapter 8)	Online meeting

Participants of discussions: discussion participants are listed in **Table 5.3.2**.

**Table 5.3.2 Participants of Discussions on Guideline Preparation**

Name	Organization
Dr. Tetsu Nakamura	PMS President (- December 2019)
Dr. Masaru Murakami	PMS President (January 2020 -)
Ms. Chiyoko Fujita	PMS Support Unit
Mr. Shohei Urata	PMS Support Unit
Mr. Takafumi Momii	PMS Support Unit
Mr. Hayato Yamashita	PMS Support Unit
Mr. Suihei Kabayama	PMS Support Unit
Ms. Kazuko Nishioka	PMS Support Unit Assistance
Mr. Atsushi Kojima	PMS Technical Advisor
Mr. Norio Owa	PMS Technical Advisor
Mr. Takashi Higuchi	PMS Technical Advisor
Mr. Osamu Miyamoto	PMS Technical Advisor
Mr. Tetsuya Tokunaga	Director of Peshawar-kai
Mr. Yoshitake Hirofumi	JICA, South Asia Div, (Afghanistan, Pakistan, Nepal)
Mr. Nagata Kenji	JICA, Senior Advisor on Water Resources and Disaster
Mr. Masakazu Miyagi	CTII
Mr. Hideki Konno	CTII
Mr. Michiaki Hosono	CTII (contracted)
Mr. Yutaka Hayashi	Fukuoka University (CTII)
Mr. Kenji Yatsu	Video Company
Ms. Miku Ueda	Video Company
Mr. Okiharu Fujimura	Printing Company

## 5.4 Training Program in Japan

The following training program was implemented in Japan inviting Afghan government personnel:

Training purpose: discussion, lectures, and site visit

Training period: September 8 to 16, 2019

Training venue: Chiyoda Ward (Tokyo), Fukuoka City (Fukuoka), Asakura City (Fukuoka), Chikushino City (Fukuoka), Aso City (Kumamoto), Aso-gun (Kumamoto) and Kikuchi-gun (Kumamoto)

Training contents: the training contents for Afghan government personnel are described in **Table 5.4.1**. Major contents include the following items:

- A lecture by Dr. Tetsu Nakamura on the history, goals, and effects of PMS method irrigation projects



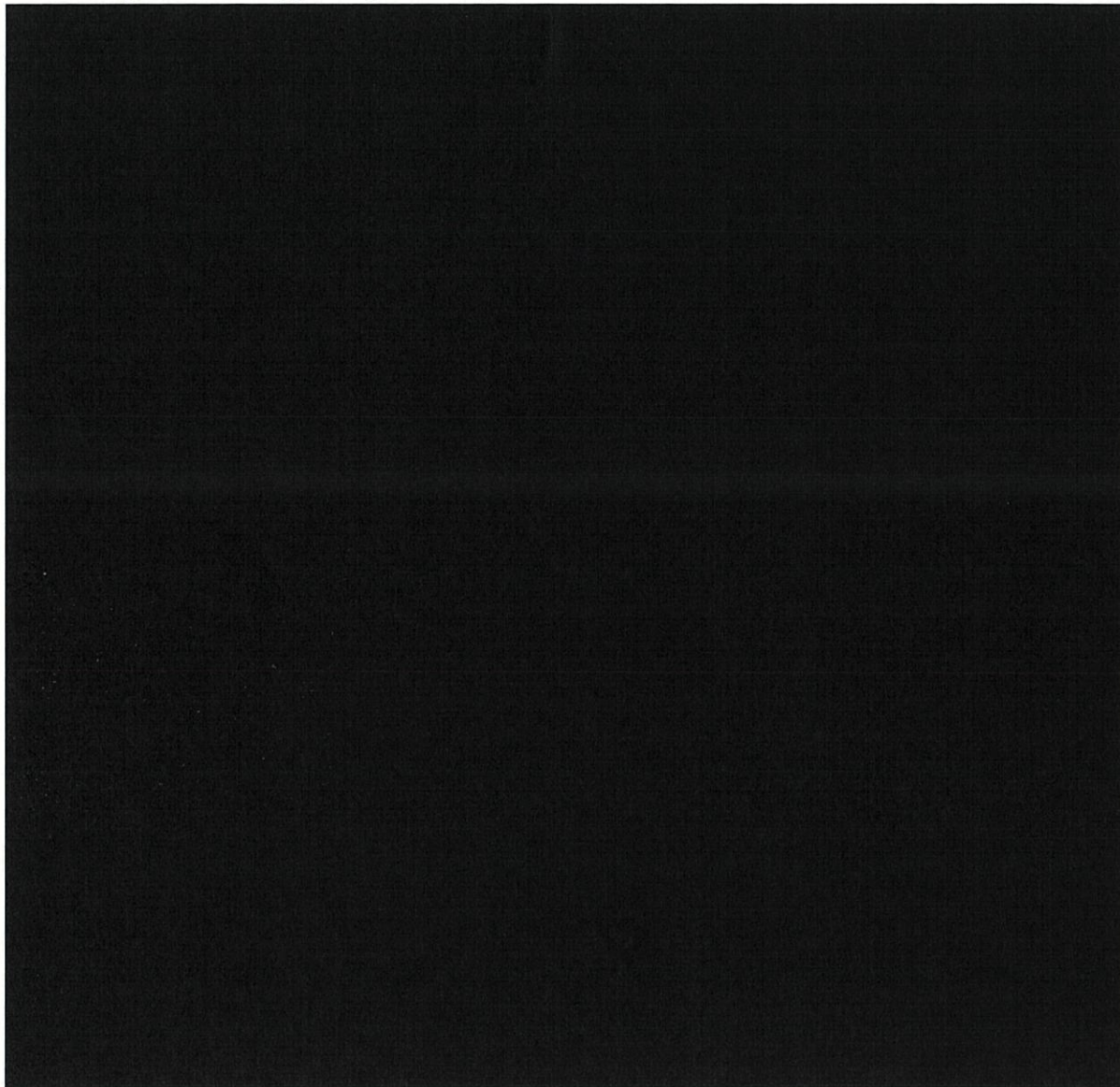
- A presentation on boosting agricultural production and improving resident's (farmer's) livelihood environment by PMS method irrigation projects and a lecture on issues to increase agricultural productivity
- Discussions on preparation policy for PMS method irrigation project guidelines, pamphlets, and videos
- Site visit to Yamada weir and relevant intake facilities which were model facilities of PMS method irrigation projects

**Table 5.4.1 Training Program in Japan**

Date	Time	Discussion contents		Venue
September 8, 2019	17:35 20:00	Afghan trainees arrived in Japan via Dubai Stayed in Hotel New Otani		Chiyoda Ward, Tokyo
September 9, 2019	9:30 11:00 13:00 16:00 19:00	Visited the JICA Headquarters, orientation Visited the Ministry of Foreign Affairs Observation in Tokyo (Imperial Palace and Ginza) Travel (Haneda Airport to Fukuoka Airport) JAL325 Checked in to hotel		Chiyoda Ward, Tokyo  Asakura City, Fukuoka
September 10, 2019	10:15 11:00 11:50 13:50 16:00 17:30	Viewed the Chikugo River, Yamada weir and Chikugo plain Welcome reception Lecture by Dr. Nakamura Visited Yamada weir and farming tool demonstration (foot thresher, etc.) Presentation on agriculture Arrived at hotel		Asakura City, Fukuoka
September 11, 2019	9:00  13:30  14:20 14:40 16:00 17:30	Discussions on irrigation project guideline preparation Objectives of Sanren Suisha no Sato and its actual operation Visit triple water wheels Beekeeping in the Fujii apiary Discussions between JICA staff and MEW personnel Arrived at hotel	On surveying (PMS staff)  On surveying (PMS staff)   Agriculture observation (paddy field, etc.) Arrived at hotel	Asakura City, Fukuoka
September 12, 2019	9:00  13:30 19:00	Discussions on irrigation project guideline preparation Agriculture observation (citrus management and pruning works) Checked in to hotel	On surveying (PMS staff)  On surveying using latest instruments Checked in to hotel	Asakura City, Fukuoka  Chikusino City, Fukuoka Aso City, Kumamoto
September 13, 2019	9:30 13:00 16:00 19:00	Visited Babagusuide no Hanaguri, weir, etc. Observation in Aso (Shirakawa water source, etc.) Kikuchi valley Checked in to hotel		Kikuchi-gun, Kumamoto Aso-gun, Kumamoto Kikuchi City, Kumamoto Fukuoka City, Fukuoka
September 14, 2019	10:00 15:00 18:30 19:00	Wrap-up meeting Reception by Peshawar-kai Travel (Fukuoka Airport to Haneda Airport) ANA266 *Ministerial personnel Checked in to hotel *PMS staff		Fukuoka City, Fukuoka
September 15, 2019	0:30 11:00 18:00	Haneda to Dubai (EK313) *Ministerial personnel Dubai to Kabul (EK640) *Ministerial personnel Travel (Fukuoka Airport to Haneda Airport) JAL326 *PMS staff		Fukuoka City, Fukuoka

Date	Time	Discussion contents	Venue
September 16, 2019	0:30	Haneda to Dubai (EK313) *PMS staff	
	11:00	Dubai to Kabul (EK640) *PMS staff	

Participants: Training participants in Japan are listed in **Table 5.4.2**.



## 5.5 Surveying Training

During the training program in Japan, the following surveying training was conducted:

Venue: Asakura City, Fukuoka Prefecture

Period: September 11 to 12, 2019

Contents: Surveying training (plane table surveying and drawing)

Training on the latest instruments (3D laser, photography from drones and tracking total stations)

Purpose: to improve the survey capacity of Afghan government officials and PMS local staff

Participants: same as those participants in the training program in Japan



## Schedule:

Date	Time	Training contents
September 11, 2019	9:30 to 12:00	Field survey by sketching prior to surveying works Conducted plane table surveying and created plane drawing using alidade
	13:00 to 17:00	Conducted plane table surveying and created plane drawing using alidade Created plane drawings using total station and electrical plane table instruments
September 12, 2019	9:30 to 12:00	Field survey by sketching prior to surveying works Conducted plane table surveying and created plane drawing using alidade
	14:00 to 17:00	Surveying training with latest instruments (3D laser, photography from drones and tracking total station)

## Training contents:

## 1) Surveying

Prior to surveying training, Dr. Nakamura requested to train [REDACTED] so that he could create drawings. The specific training contents were as follows:

- Plan works by conducting a field survey by sketching prior to surveying works
- Basic demonstration using alidade to confirm the current comprehension of [REDACTED]
- Hands-on training on how to create plane drawings without using CAD
- Considering the future, conduct training on plane drawing creation using electrical plane table instruments

## 2) Latest surveying instruments

Training on the following items using the latest surveying instruments was conducted for three Afghan government personnel, two PMS local staff and Peshawar-kai staff. The on-site training venue in the ground area of the Fukuoka Prefecture Agricultural Experiment Station allowed to compare the actual field terrain and 3D data created. This training focused on trainees' confirmation and understanding of how to utilize the data.

- Three-dimensional surveying using 3D laser and 3D images/drawings creation utilizing photography from drones.
- Surveying training using tracking total station and electrical plane table instruments

## 5.6 Explanatory Discussions on Guidelines (remote discussion)

Remote discussions with Afghan government personnel using draft PMS method irrigation project guidelines were carried out as follows:

Method: online

Date: March 10, 2021

Explanatory contents: during remote discussions with Afghan government personnel, the guideline contents were explained and lectured. The lecture contents were sufficiently understandable for participants and the guidelines were finalized based on feedback from participants in the explanatory discussions.

Explanatory contents on guidelines are described in **Table 5.6.1**. During the explanatory discussions, the following items were considered:



- Obtain insights on the coordination mechanism of upstream/downstream and left/right bank at the community level from a basin perspective and observation and measurement of river channels.
- Understand the advantages of the PMS method irrigation facility and the layout plan for the intake and flood control facilities. The stability calculation of structures was also explained.
- To understand the existing facility, explain facility construction management following the on-site visit to weirs and irrigation channels during the training program in Japan.
- Ensure that the contents of lectures and demonstrations are fully understandable for participants and remain in close contact with training participants after they return to Afghanistan to help them deepen their understanding. Moreover, finalize guidelines based on feedback from participants during the explanatory discussions.

**Table 5.6.1 Explanatory Contents on Guidelines**

Table of Contents	Main Explanatory Contents
Chapter 1 What are the “PMS method irrigation project guidelines”?	
1.1 Background	The PMS started construction of irrigation canals in 2003 and has been working to secure 16,500 ha of irrigation area by 2020 and develop irrigation facilities to support the livelihoods of 650,000 people.
1.2 Purpose of the Guidelines	The purpose of the PMS method irrigation project guidelines is to contribute to the development of Afghanistan by providing Dr Nakamura's philosophy, dialogue process with the population and technical guidelines for PMS method irrigation projects.
1.3 Concept and Contents of the Guidelines	The concept of the PMS method irrigation project guideline is to disseminate and promote sustainable irrigation projects suitable for Afghanistan by correctly understanding, practicing, applying, improving, and developing PMS method irrigation projects.
1.4 Structure of the Guidelines	The guidelines consist of: basic concept consultation with the residents on PMS method irrigation projects; assessment of river conditions; layout planning, design, construction management, operation and maintenance of irrigation and flood control facilities; and operation and maintenance of the facilities.
1.5 Target Beneficiaries of the Guidelines	The guidelines are intended for all users who want to learn about PMS method irrigation projects, but content is tailored for various audiences, including policy makers, engineers, and farmers (residents).
1.6 Overview of the PMS Method Irrigation Project	The PMS method irrigation project aims to involve local residents from the basic concept stage, ensuring their ownership of the project from planning, design, construction, operation, maintenance and ensuring irrigated agriculture technology, and to enable the operation and maintenance of the irrigation system by the residents after the project implementation. The PMS method irrigation system has succeeded in creating a sustainable irrigation system that is resilient to flooding periods. The use of natural materials means that any damage to the facilities can be dealt with by local people.
1.7 Basic Civil Engineering Techniques Used in PMS	After PMS method irrigation projects are completed, the main basic civil engineering techniques for PMS method irrigation projects that farmers responsible for the operation and maintenance of these facilities should learn are gabion works, vegetation works, masonry and soil cementing works.
Chapter 2 How should a PMS method irrigation project be launched together with farmers?	
2.1 Launching of a PMS Method Irrigation Project	The first step in setting up a PMS method irrigation project is to select a region, and then create a basic concept together with farmers in the selected region in consultation with them. The project aims to encourage the establishment of local ownership and contribute to the independent development of the area.
2.2 Selection of Area Suitable for the PMS Method Irrigation Project	Obtain a list of existing candidate irrigation areas from the Afghan government or local government. The primary selection of candidate areas is carried out from the perspective of whether the area is the requested land or not, which is defined as the basic policy for the selection of PMS method irrigation project areas.



Table of Contents	Main Explanatory Contents
	The candidate sites are then narrowed down based on the crop productivity of the land, the possibility of securing irrigation water and the availability of construction materials. Furthermore, the final selection of project areas is made by checking whether local communities are willing to operate and maintain irrigation facilities properly.
2.3 Formulation of Basic Concept of the PMS Method Irrigation Project through Discussion with Farmers	Understand the real needs of farmers and develop a master plan for irrigation projects that can meet those needs. Obtain approval from the provincial and central government to build irrigation facilities, secure a budget and start construction.
Chapter 3 How should water source rivers be understood?	
3.1 Why Should We Understand the River Conditions?	Irrigation facilities and flood control facilities are constructed in or adjacent to river channels. Planning and designing safe and stable structures requires an understanding of river conditions during flood and drought periods.
3.2 Collection and Organization of Existing Information	The following information should be collected and organized. River basin conditions (topography, geology, meteorology, hydrology, etc.), river channel conditions, river flows and flow regimes during floods and low flows, and the impact of new water abstraction on downstream water use.
3.3 Interview Survey with Residents	Residents living in the vicinity of the target area are often aware of river conditions during floods and low water. Interviews will therefore be conducted to collect various information on rivers that will be useful for the implementation of the PMS method irrigation project.
3.4 Observation and Measurement of River Condition	Observation of river channel conditions and information on water levels, velocities, flow rates, etc. are necessary for the planning and design of PMS method irrigation facilities. River channel conditions should be adequately assessed through existing satellite image and interviews with local residents. As sandbars may be utilized for abutting intake weirs, the movement and change of sandbars should be observed periodically and after major floods. The stability of the river channel can also be determined by plotting the relationship between the friction velocity $U^*$ and the representative grain size $dR$ of the riverbed material on a graph.
3.5 River Survey Methods	The planning, design and construction of PMS method irrigation facilities require riverbed material surveys and cross-sectional, longitudinal, and topographic survey of the river. In addition, new methods of river surveying exist, such as auto tracking total stations, 3D laser survey equipment, drones and ADCP (acoustic doppler current profiler).
3.6 Setting Basic Information for Irrigation Facility Plan and Design	The design of irrigation facilities requires the following design conditions: 1) design drought discharge and design drought level; 2) design flood discharge and design flood level; 3) sediment volume and sediment particle size.
Chapter 4 How should irrigation facilities be planned and designed?	
4.1 Layout planning and Design Process of Irrigation Facilities	Develop a layout plan for the irrigation facilities of the PMS method irrigation system, i.e., intake weirs, intake gates, steep gradient main irrigation canals, main irrigation canals, sand basins, reservoirs, siphons, and main drainage channels. In the design of the various aspects of the irrigation facilities and the longitudinal and lateral design, the necessary functions are ensured by considering various trade-offs, taking into account the constraints of land acquisition, workability, economy, and maintainability.
4.2 Design of the Intake Weir and Intake Gate	1) Basic design policy for intake weirs and gates; 2) Type of intake weir (boulder oblique weir); 3) Plane design of the intake weir and intake gate (location, plan shape); 4) Basic specification design for intake weir and intake gate (intake gate bed height, weir top height, weir overflow water level); 5) Specification design of the intake weir (longitudinal and transverse design); 6) Specification design of the intake gates (longitudinal and cross-sectional design); 7) Specification design of the sand flushing ditch (longitudinal and transverse design)
4.3 Design of the Main Irrigation Canal	1) Basic policy for the design of the irrigation main canal, 2) Type and design policy for the main irrigation canal, 3) Specification design of the main irrigation canal (plan design,



Table of Contents	Main Explanatory Contents
	longitudinal design, structural design), 4) Design of the water wheel in the main irrigation canal, 5) Effects of vegetation works along the main irrigation canal
4.4 Sand Basin (Regulating Pond) Design	1) Basic policy for designing the sand basin (Regulating pond), 2) Type and design policy for sand basin (Regulating pond), 3) Specification design of the sand basin (Regulating pond) (plan design, sectional design, structural design)
4.5 Design of the Reservoir, Siphon, and other Facilities	1) Basic policy for the design of the reservoir, siphon, and other facilities, 2) Type and design policy for the reservoir, siphon, and other facilities, 3) Specification design of reservoirs and siphons (plan design, sectional design, structural design)
4.6 Design of the Main Drainage Canal	1) Basic policy for designing the main drainage canal; 2) Type and design policy for the main drainage canal; 3) Specification design of main drainage canal (plan design, longitudinal design, structural design)
Chapter 5 How should flood control facilities be planned and designed?	
5.1 Layout Planning and Design Process of Flood Control Facilities	Develop a layout plan for the flood control facilities of the PMS method irrigation system, i.e., the dikes and the stone spur dikes. In the plan design, various designs and longitudinal and cross-sectional designs of dikes and stone spur dikes, consideration should be given to the location of farmland, residential areas and irrigation channels along the river, and the safety of irrigation facilities in the river against flooding, taking into account site acquisition constraints, ease of construction, economy and ease of operation and maintenance.
5.2 Dike Design	1) Basic design policy of dikes; 2) Type and design policy of dike revetments; 3) Specification design of dikes (plan design, sectional design, structural design)
5.3 Design of Stone Spur Dikes	1) Basic design policy for stone spur dikes, 2) Type of stone spur dikes, 3) Design policy and specifications for stone spur dikes (plan design, sectional design, structural design)
Chapter 6 How should PMS method irrigation facilities be constructed?	
6.1 Preparation of Construction Supervision and Construction Works	Establishing the project implementation and execution systems, planning of the construction schedule, procurement and preparation of construction materials and equipment, quality management, cost management, ensuring safety and security, and capacity building of construction workers.
6.2 Construction Supervision of Intake Weirs and Gates	1) Construction procedures of intake weir/gate; 2) Construction supervision of intake weir (boulders, spillway, wicker works, temporary road); 3) Supervision of the construction of intake gates (foundation, base slab, gate pier, flush boards, revetment); 4) Supervision of the construction of sand flushing ditch (foundation, base slab, gate pier, flush boards, bed protection)
6.3 Construction Supervision of the Reservoir	1) Construction supervision of reservoir (dike embankment, leakage control)
6.4 Construction Supervision of the Main Irrigation Canal and Wicker Works	1) Construction supervision of main irrigation canal and wicker works (soil cement lining, gabion works, wicker works, tree planting)
6.5 Construction Supervision of Siphon	1) Construction supervision of siphon (setting of location, shafts, and siphon)
6.6 Construction Supervision of the Sand Basin	1) Construction supervision of sand basin (drain gate, basin floor, said drain channel, revetment, transmission gate)
6.7 Construction Supervision of the Drainage Canal	1) Construction supervision of main drainage canal (U-shaped ditch and upper earth retaining)
6.8 Construction Supervision of Dike/Stone Spur Dike	1) Construction supervision of dike (dike embankment, riprap, vegetation); 2) Construction supervision of stone spur dike (foundation, main body of stone spur dike)
Chapter 7 How should operation and maintenance of PMS method irrigation facilities be implemented?	
7.1 Establishment of Organizations and Institutions Related to	The operation and maintenance of irrigation facilities should be carried out by the beneficiary farmers on their own initiative.



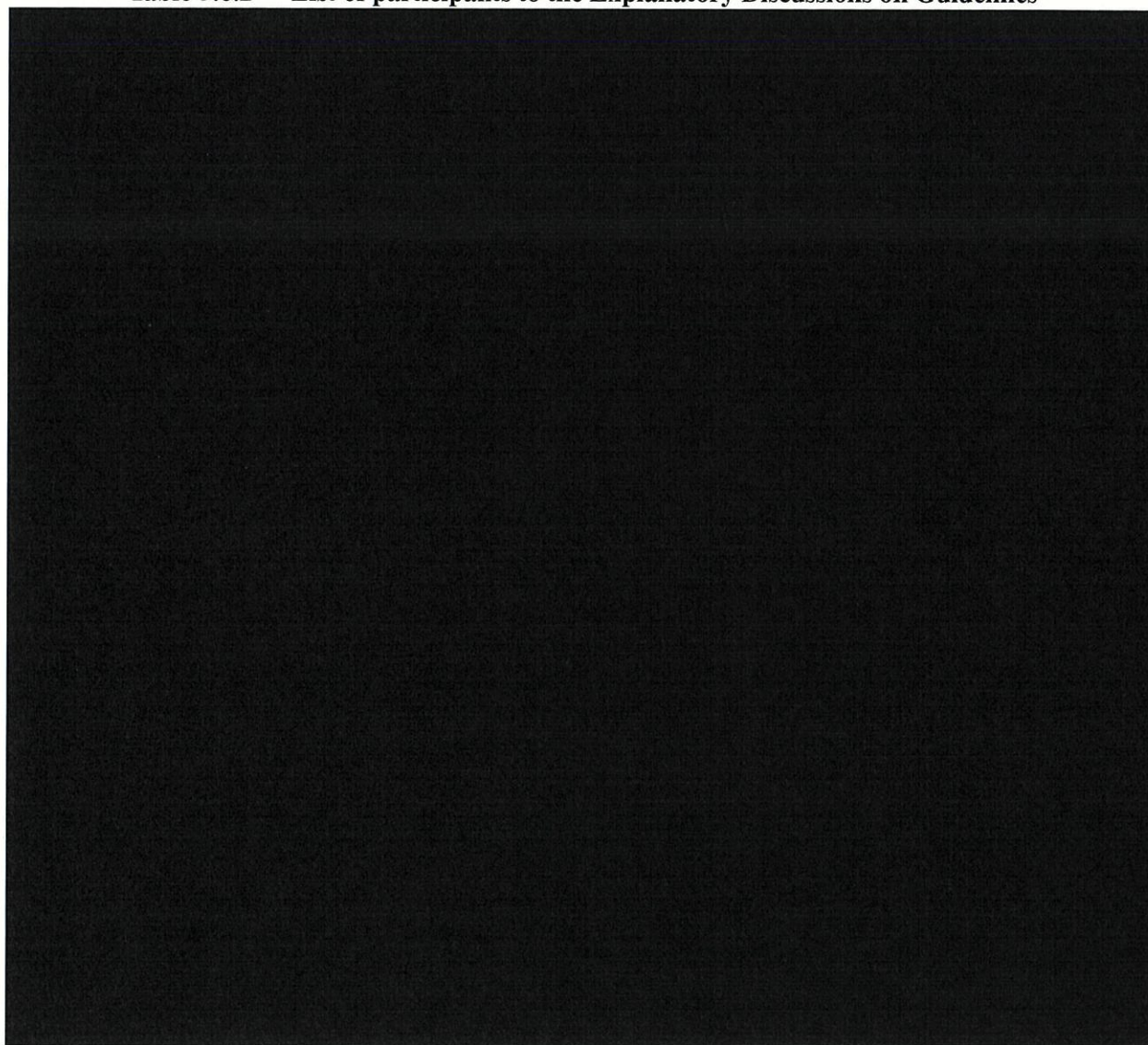
Table of Contents	Main Explanatory Contents
Operation and Maintenance of Irrigation Facilities	<p>If major repairs are required, e.g., due to natural disasters, support from the project implementation entities or the government is essential.</p> <p>The organizations that operate and maintain irrigation facilities are generally water user association (WUA) and irrigation association (IA).</p> <p>The bodies concerned with water governance are NWARA, MAIL and MRRD.</p> <p>As a rule, operation and maintenance funding is borne by the water users.</p>
7.2 Operation of Irrigation/Water Distribution Facilities (Intake Gates, Sand Flushing Ditches, Drainage Gates, Transmission Gates, and Distribution Gates)	<p>The water allocation plan is developed by the WUA or IA in consensus with the beneficiary farmers.</p> <p>The project implementation entities also advise the WUA or IA.</p> <p>The operation of intake gates, sand flushing ditch, drain gates, transmission gates and diversion gates are carried out.</p> <p>Patrols related to water use and response to abnormalities such as droughts and floods will be carried out.</p>
7.3 Maintenance of Irrigation Facilities	<p>PMS method irrigation projects make extensive use of natural materials, avoiding concrete structures as much as possible.</p> <p>On the other hand, minor damage is expected due to the natural materials, and emphasis is placed on maintenance and management activities.</p> <p>Capacity development in water allocation operation, sediment management and facility repair will be provided through on-the-job training for at least three years after the completion of construction.</p>
7.4 Large-Scale Repair and Restoration of Irrigation Facilities - Typical Destruction Patterns and Countermeasures	<p>Large scale repairs and rehabilitation are carried out at the expense of the project implementation entities and the government, with the beneficiary farmers providing labour.</p> <p>The irrigation facilities in the PMS have been damaged and extensively rehabilitated, and improvements have been made through trial and error to reach the final form.</p> <p>Construction materials such as stones and gabion mattress have been stored for future emergency situation.</p>
Chapter 8 How should agriculture and irrigation technology be improved?	
8.1 Establishment of Demonstration Farm for Technical Extension	<p>A rural social survey conducted in 2018 to objectively assess PMS method irrigation projects revealed low crop productivity due to inappropriate irrigation practices.</p> <p>To address this, demonstration farm will be established in the beneficiary areas of several irrigation canal networks in order to efficiently disseminate cultivation techniques.</p> <p>During the project period, the project implementation entities will take the lead in establishing them, involving the DAIL(District Agriculture, Irrigation and Livestock Offices), and after the project, the WUA or IA will take the lead in managing them independently.</p>
8.2 On-Farm Water Management	<p>Appropriate water use in irrigated fields is an important issue for preventing waterlogging damage and improving crop productivity.</p> <p>Appropriate water management practices are described below.</p> <p>1) Irrigation water distribution method; 2) Types of irrigation method in the field; 3) Flood irrigation, furrow irrigation and border irrigation technology; 4) New irrigation method suitable for Afghanistan (irrigation on ridges); and 5) Points to note in on-farm water management</p>
8.3 Cultivation Technology	<p>Effective technologies to enable sustainable and locally feasible crop cultivation to improve crop productivity in existing PMS method irrigation project areas, such as.</p> <p>1) Sustainable production by organic farming, 2) How to evenly sow seed in small-scale farm, 3) Effect of shade for improving productivity, 4) Raised bed cultivation in wetland to prevent waterlogged damage, 5) Increase in rice cultivation and countermeasures (introduction of appropriate upland rice varieties), 6) Improving nursery production (kneaded nursery bed)</p>
8.4 Soil Improvement Technology	<p>The soils in the study area are characterized by sandy and high pH, and these soils are fragile and difficult to manage.</p> <p>Soil improvement techniques are described below.</p> <p>1) Topsoil improvement by soil profile survey; 2) Soil analysis for appropriate soil management; and 3) Maintaining soil fertility with leguminous crops cultivation</p>



Table of Contents	Main Explanatory Contents
Appendix	
Analysis Method for Sandbar and Scouring Using Hydraulic Parameters	1) Classifications of Sandbar; 2) Analysis of Scouring
Example of Design Calculation for Irrigation Facilities	1) Example calculation for stable boulders, 2) Example design calculation of flush board for intake gate, 3) Calculation example of sand flushing capacity of sand flushing ditch, 4) Examination of cross-sectional area of underground pipe of siphon, 5) Example calculation for sand flushing capacity of drain gate

Participants: participants to the explanatory discussions are listed in **Table 5.6.2**.

**Table 5.6.2 List of participants to the Explanatory Discussions on Guidelines**



## 5.7 Agricultural Training

Remote discussions with Afghan government personnel using draft PMS method irrigation project guidelines were carried out as follows:

Method: online



Date: April 6, 2021

Explanatory contents: explanatory contents were provided with participants via lecture and demonstration in fully understandable manner while keeping in close contact with participants after they return to Afghanistan to help them deepen their understandings. Moreover, finalize guidelines based on feedback from participants during the explanatory discussions.

In the explanatory discussions on Chapter 8 as described in **Table 5.6.1**, the following points were considered:

- Verification whether the contents of training in the previous survey (Data Collection Survey on Agriculture and Rural Development) was properly implemented.
- Irrigation methods and ridging at distal ends to prevent root rot due to excessive irrigation (explanation and discussion of current technical problems, improvement methods, etc.)
- Technical methods to make up for the lack of use of expensive agricultural materials (how to identify nutrient deficiencies, crop rotation for disease prevention, intercropping to prevent insect damage, etc.)
- Explanation for basic knowledge of calcareous soils in Afghanistan and fertilization techniques to improve crop productivity under these soils
- Field boundary survey, topographic survey for water diversion, etc.

In particular, topographic survey for water diversion was conducted in a form of surveying practice during the training program in Japan.

Participants: participants of the explanatory discussions (on agricultural matters) are listed in **Table 5.7.1**.



## 5.8 Proposal of Training Curriculum using Guidelines

### 5.8.1 Formulation Policy for Curriculum Proposal

The PMS methods involve, decision maker (project implementation entities), engineers, Mirab, residents (farmer) and other persons concerned with different backgrounds. For example, Mirab and residents (farmer) are expected to proactively maintain and manage irrigation facilities. If their academic knowledge and literacy skills are insufficient, their work will differ from that of decision maker (project implementation entities) and engineers. Accordingly, a training curriculum proposal tailored to each stakeholder was considered based on the guidelines.

A proposed training curriculum using guidelines was formulated based on the following policies and according to the responsibility of each entity:

- The training curriculum for decision maker (project implementation entities) shall comprehensively include 1) the background and purpose of the guidelines, 2) how to launch a PMS method irrigation project, 3) water source rivers, 4) facility planning, 5) construction supervision, 6) maintenance and management and 7) how to disseminate agricultural technology.
- The training curriculum for engineers shall include 1) observation and surveying of water source rivers, design method and construction supervision of intake facilities and flood control facilities, 3) agricultural technology for boosting crop productivity and 4) river channel analysis and design calculation example of intake facilities in addition to training contents for decision maker (project implementation entities) to include technical details.
- Training for Mirab shall focus on the operation, maintenance, and management of PMS method irrigation facilities as well as 1) the background and purpose of guideline preparation and 2) steps to launch the PMS method irrigation projects. The training contents shall presume that Mirab will be deeply involved in operating, maintaining and managing PMS method irrigation facilities in future.
- For residents (farmer), their training focuses on 1) the construction of PMS method irrigation facilities and 2) improvement of irrigation agricultural technology and supplementary covers 3) background and purpose of guideline preparation, 4) steps to launch the PMS method irrigation project and 5) relevant organization and systems for operation, maintenance, and management. The training contents shall presume that residents (farmer) will be deeply involved in PMS method irrigation facility construction and agricultural technological improvement in future.

Table 5.8.1 describes details of the training (explanatory) contents by target.

**Table 5.8.1 Concept of Training Curriculum Formulation**

Target	Category	Explanatory chapter	Explanatory content
Decision maker (project implementation entities)	Guidelines	Chapter 1	Background, purpose, concept, etc. of guideline preparation, the overall picture of the PMS method irrigation project
		Chapter 2	Steps to launch the PMS method irrigation project, how to select project site, steps to formulate basic concept of the irrigation project



Target	Category	Explanatory chapter	Explanatory content
		Chapter 3	Understanding the target river conditions, impact of basin information, river channel conditions and downstream on water intake, resident information related to river conditions during flooding or low water discharge
		Chapter 4	Layout plan and design flow of intake facility
		Chapter 5	Layout plan and design flow of flood control facility
		Chapter 6	Project implementation system, work plan, material and equipment procurement, quality control, cost management, ensuring safety and security, capacity development of construction workers
		Chapter 7	Relevant organizations and systems to operate, maintain and manage irrigation facility, operation, maintenance, and management of irrigation facility
		Chapter 8	Establishment of a demonstration farm to disseminate cultivation technology
	Field training	Site visits: KamaI, KamaII, Miran, MarwaridII, Kashkot, Marwarid, Shetlaw Vil., Gamberi Farm Concept of site selection: Comprehensively visit representative PMS method irrigation facilities, beneficiary villages and Gamberi Farm.	
Engineer	Guidelines	Chapter 1	Same as the explanation to decision makers
		Chapter 2	Same as the explanation to decision makers
		Chapter 3	In addition to the explanation to decision makers, observation, and measurement of river conditions (water level, flow velocity, water flow), river surveying method, basic volume setting (water level, water flow, particle size and volume of sedimentation) to plan and design irrigation facility
		Chapter 4	In addition to the explanation to decision makers, design methods for each intake facility (main irrigation canals, sand basins, reservoirs, siphons, and main drainage channels)
		Chapter 5	In addition to the explanation to decision makers, design methods for each flood control facility (embankment, stone spur dike)
		Chapter 6	In addition to the explanation to decision makers, details of construction supervision methods for each intake facility and flood control facilities
		Chapter 7	Same as the explanation to decision makers
		Chapter 8	In addition to the explanation to decision makers, water management, cultivation, and land improvement technologies for farms
		Appendix	Analytical method for sandbars and scouring using hydraulic parameters, design calculation example of intake facilities
	Field training	Site visits: Qasimabad, Kama I, Kama II, Miran, Shigi, Marwarid II, Marwarid, Kashkot, Bal-Kashkot, Sheiwa, Shetlaw Vil., Gamberi Farm Concept of site selection: visit all PMS method irrigation facilities as well as comprehensively visiting beneficiary villages and Gamberi Farm	
Mirab	Guidelines	Chapter 1	Background and purpose of guideline preparation
		Chapter 2	Steps to launch the PMS method irrigation project
		Chapter 7	Same as the explanation to decision makers and engineers
	Field training	Site visit: KamaI, KamaII, MarwaridII Concept of site selection: visit several representative PMS method irrigation facilities and conduct a facility operation training in a facility (e.g., Marwarid II)	
Residents (farmer)	Guidelines	Chapter 1	Background and purpose of guideline preparation
		Chapter 2	Steps to launch the PMS method irrigation project

Target	Category	Explanatory chapter	Explanatory content
		Chapter 6	Details of construction supervision methods for each intake facility and flood control facilities
		Chapter 7	Relevant organizations and systems to operate, maintain and manage irrigation facilities
		Chapter 8	Same as the explanation to engineers
	Field training	Site visit: Kamal, Kama II, Marwarid II, Gamberi Farm Concept of site selection: visit several representative PMS method irrigation facilities and conduct agricultural training in Gamberi Farm	



Table 5.8.2 Explanatory Contents by Target (1)

Table of Contents	Decision Maker (Project Implementation Entities)	Engineer	Mirab	Residents (Farmer)	Main Explanatory Contents	Credit (Hour)
Brochure	●	●	●	●	Understanding of the main points of PMS method irrigation projects - Functions of PMS method irrigation facilities - Activities and outputs of PMS irrigation project - What is the "PMS method irrigation project guidelines"? - How should a PMS method irrigation project with the farmers be launched? - What and how should water source rivers be understood? - How should irrigation facilities and flood control facilities be planned and designed? - How should PMS method irrigation facilities be constructed? - How should operation and maintenance of PMS method irrigation facilities be implemented? - How to improve crop cultivation technologies?	0.5
DVD	●	●	●	●	ditto	0.5
Summary	●	●			ditto	0.5
Chapter 1 What are the "PMS method irrigation project guidelines"?						2.7
1.1 Background	●	●	●	●	The PMS started construction of irrigation canals in 2003 and has been working to secure 16,500 ha of irrigation area by 2020 and develop irrigation facilities to support the livelihoods of 650,000 people.	0.2
1.2 Purpose of the Guidelines	●	●	●	●	The purpose of the PMS method irrigation project guidelines is to contribute to the development of Afghanistan by providing Dr Nakamura's philosophy, dialogue process with the population and technical guidelines for PMS method irrigation projects.	0.1
1.3 Concept and Contents of the Guidelines	●	●			The concept of the PMS method irrigation project guideline is to disseminate and promote sustainable irrigation projects suitable for Afghanistan by correctly understanding, practicing, applying, improving and developing PMS method irrigation projects.	0.2
1.4 Structure of the Guidelines	●	●			The guidelines consist of: basic concept consultation with the residents on PMS method irrigation projects; assessment of river conditions; layout planning, design, construction management, operation and maintenance of irrigation and flood control facilities; and operation and maintenance of the facilities.	0.6
1.5 Target Beneficiaries of the Guidelines	●	●			The guidelines are intended for all users who want to learn about PMS method irrigation projects, but content is tailored for various audiences, including policy makers, engineers and farmers (residents).	0.2
1.6 Overview of the PMS Method Irrigation Project	●	●			The PMS method irrigation project aims to involve local residents from the basic concept stage, ensuring their ownership of the project from planning, design, construction, operation, maintenance and ensuring irrigated agriculture technology, and to enable the operation and maintenance of the irrigation system by the residents after the project implementation. The PMS method irrigation system has succeeded in creating a sustainable irrigation system that is resilient to flooding periods. The use of natural materials means that any damage to the facilities can be dealt with by local people.	1.1
1.7 Basic Civil Engineering Techniques Used in PMS	●	●		●	After PMS method irrigation projects are completed, the main basic civil engineering techniques for PMS method irrigation projects that farmers responsible for the operation and maintenance of these facilities should learn are gabion works, vegetation works, masonry and soil cementing works.	0.4
Chapter 2 How should a PMS method irrigation project be launched together with farmers?						4.4
2.1 Launching of a PMS Method Irrigation Project	●	●	●	●	The first step in setting up a PMS method irrigation project is to select a region, and then create a basic concept together with farmers in the selected region in consultation with them. The project aims to encourage the establishment of local ownership and contribute to the independent development of the area.	0.1
2.2 Selection of Area Suitable for the PMS Method Irrigation Project	●	●			Obtain a list of existing candidate irrigation areas from the Afghan government or local government. The primary selection of candidate areas is carried out from the perspective of whether the area is the requested land or not, which is defined as the basic policy for the selection of PMS method irrigation project areas. The candidate sites are then narrowed down based on the crop productivity of the land, the possibility of securing irrigation water and the availability of construction materials. Furthermore, the final selection of project areas is made by checking whether local communities are willing to operate and maintain irrigation facilities properly.	2.3
2.3 Formulation of Basic Concept of the PMS Method Irrigation Project through Discussion with Farmers	●	●			Understand the real needs of farmers and develop a master plan for irrigation projects that can meet those needs. Obtain approval from the provincial and central government to build irrigation facilities, secure a budget and start construction.	2.1

**Table 5.8.3 Explanatory Contents by Target (2)**

Table of Contents	Decision Maker (Project Implementation Entities)	Engineer	Mirab	Residents (Farmer)	Main Explanatory Contents	Credit (Hour)
Chapter 3 How should water source rivers be understood?						6.4
3.1 Why Should We Understand the River Conditions?	●	●			Irrigation facilities and flood control facilities are constructed in or adjacent to river channels. Planning and designing safe and stable structures requires an understanding of river conditions during flood and drought periods.	0.4
3.2 Collection and Organization of Existing Information	●	●			The following information should be collected and organized. River basin conditions (topography, geology, meteorology, hydrology, etc.), river channel conditions, river flows and flow regimes during floods and low flows, and the impact of new water abstraction on downstream water use.	1.6
3.3 Interview Survey with Residents	●	●			Residents living in the vicinity of the target area are often aware of river conditions during floods and low water. Interviews will therefore be conducted to collect various information on rivers that will be useful for the implementation of the PMS method irrigation project.	0.5
3.4 Observation and Measurement of River Condition		●			Observation of river channel conditions and information on water levels, velocities, flow rates, etc. are necessary for the planning and design of PMS method irrigation facilities. River channel conditions should be adequately assessed through existing satellite image and interviews with local residents. As sandbars may be utilized for abutting intake weirs, the movement and change of sandbars should be observed periodically and after major floods. The stability of the river channel can also be determined by plotting the relationship between the friction velocity $U^*$ and the representative grain size $dR$ of the riverbed material on a graph.	2.7
3.5 River Survey Methods		●			The planning, design and construction of PMS method irrigation facilities require riverbed material surveys and cross-sectional, longitudinal and topographic survey of the river. In addition, new methods of river surveying exist, such as auto tracking total stations, 3D laser survey equipment, drones and ADCP (acoustic doppler current profiler).	0.8
3.6 Setting Basic Information for Irrigation Facility Plan and Design		●			The design of irrigation facilities requires the following design conditions: 1) design drought discharge and design drought level; 2) design flood discharge and design flood level; 3) sediment volume and sediment particle size.	0.5
Chapter 4 How should irrigation facilities be planned and designed?						12.2
4.1 Layout planning and Design Process of Irrigation Facilities	●	●			Develop a layout plan for the irrigation facilities of the PMS method irrigation system, i.e. intake weirs, intake gates, steep gradient main irrigation canals, main irrigation canals, sand basins, reservoirs, siphons and main drainage channels. In the design of the various aspects of the irrigation facilities and the longitudinal and lateral design, the necessary functions are ensured by considering various trade-offs, taking into account the constraints of land acquisition, workability, economy and maintainability.	0.9
4.2 Design of the Intake Weir and Intake Gate		●			1) Basic design policy for intake weirs and gates; 2) Type of intake weir (boulder oblique weir); 3) Plane design of the intake weir and intake gate (location, plan shape); 4) Basic specification design for intake weir and intake gate (intake gate bed height, weir top height, weir overflow water level); 5) Specification design of the intake weir (longitudinal and transverse design); 6) Specification design of the intake gates (longitudinal and cross-sectional design); 7) Specification design of the sand flushing ditch (longitudinal and transverse design)	5.3
4.3 Design of the Main Irrigation Canal		●			1) Basic policy for the design of the irrigation main canal, 2) Type and design policy for the main irrigation canal, 3) Specification design of the main irrigation canal (plan design, longitudinal design, structural design), 4) Design of the water wheel in the main irrigation canal, 5) Effects of vegetation works along the main irrigation canal	2.0
4.4 Sand Basin (Regulating Pond) Design		●			1) Basic policy for designing the sand basin (Regulating pond), 2) Type and design policy for sand basin (Regulating pond), 3) Specification design of the sand basin (Regulating pond) (plan design, sectional design, structural design)	1.7
4.5 Design of the Reservoir, Siphon, and other Facilities		●			1) Basic policy for the design of the reservoir, siphon, and other facilities, 2) Type and design policy for the reservoir, siphon, and other facilities, 3) Specification design of reservoirs and siphons (plan design, sectional design, structural design)	1.5
4.6 Design of the Main Drainage Canal		●			1) Basic policy for designing the main drainage canal; 2) Type and design policy for the main drainage canal; 3) Specification design of main drainage canal (plan design, longitudinal design, structural design)	0.9



Table 5.8.4 Explanatory Contents by Target (3)

Table of Contents	Decision Maker (Project Implementation Entities)	Engineer	Mirab	Residents (Farmer)	Main Explanatory Contents	Credit (Hour)
Chapter 5 How should flood control facilities be planned and designed?						3.3
5.1 Layout Planning and Design Process of Flood Control Facilities	●	●			Develop a layout plan for the flood control facilities of the PMS method irrigation system, i.e. the dikes and the stone spur dikes. In the plan design, various designs and longitudinal and cross-sectional designs of dikes and stone spur dikes, consideration should be given to the location of farmland, residential areas and irrigation channels along the river, and the safety of irrigation facilities in the river against flooding, taking into account site acquisition constraints, ease of construction, economy and ease of operation and maintenance.	0.3
5.2 Dike Design		●			1) Basic design policy of dikes; 2) Type and design policy of dike revetments; 3) Specification design of dikes (plan design, sectional design, structural design)	1.7
5.3 Design of Stone Spur Dikes		●			1) Basic design policy for stone spur dikes, 2) Type of stone spur dikes, 3) Design policy and specifications for stone spur dikes (plan design, sectional design, structural design)	1.4
Chapter 6 How should PMS method irrigation facilities be constructed?						5.6
6.1 Preparation of Construction Supervision and Construction Works	●	●			Establishing the project implementation and execution systems, planning of the construction schedule, procurement and preparation of construction materials and equipment, quality management, cost management, ensuring safety and security, and capacity building of construction workers.	1.5
6.2 Construction Supervision of Intake Weirs and Gates		●		●	1) Construction procedures of intake weir/gate; 2) Construction supervision of intake weir (boulders, spillway, wicker works, temporary road); 3) Supervision of the construction of intake gates (foundation, base slab, gate pier, flush boards, revetment); 4) Supervision of the construction of sand flushing ditch (foundation, base slab, gate pier, flush boards, bed protection)	1.7
6.3 Construction Supervision of the Reservoir		●		●	1) Construction supervision of reservoir (dike embankment, leakage control)	0.3
6.4 Construction Supervision of the Main Irrigation Canal and Wicker Works		●		●	1) Construction supervision of main irrigation canal and wicker works (soil cement lining, gabion works, wicker works, tree planting)	0.9
6.5 Construction Supervision of Siphon		●		●	1) Construction supervision of siphon (setting of location, shafts and siphon)	0.3
6.6 Construction Supervision of the Sand Basin		●		●	1) Construction supervision of sand basin (drain gate, basin floor, said drain channel, revetment, transmission gate)	0.3
6.7 Construction Supervision of the Drainage Canal		●		●	1) Construction supervision of main drainage canal (U-shaped ditch and upper earth retaining)	0.2
6.8 Construction Supervision of Dike/Stone Spur Dike		●		●	1) Construction supervision of dike (dike embankment, riprap, vegetation); 2) Construction supervision of stone spur dike (foundation, main body of stone spur dike)	0.5
Chapter 7 How should operation and maintenance of PMS method irrigation facilities be implemented?						3.5
7.1 Establishment of Organizations and Institutions Related to Operation and Maintenance of Irrigation Facilities	●	●	●	●	The operation and maintenance of irrigation facilities should be carried out by the beneficiary farmers on their own initiative. If major repairs are required, e.g. due to natural disasters, support from the project implementation entities or the government is essential. The organisations that operate and maintain irrigation facilities are generally water user association (WUA) and irrigation association (IA). The bodies concerned with water governance are NWARA, MAIL and MRRD. As a rule, operation and maintenance funding is borne by the water users.	1.1
7.2 Operation of Irrigation/Water Distribution Facilities (Intake Gates, Sand Flushing Ditches, Drainage Gates, Transmission Gates and Distribution Gates)	●	●	●		The water allocation plan is developed by the WUA or IA in consensus with the beneficiary farmers. The project implementation entities also advise the WUA or IA. The operation of intake gates, sand flushing ditch, drain gates, transmission gates and diversion gates are carried out. Patrols related to water use and response to abnormalities such as droughts and floods will be carried out.	1.2
7.3 Maintenance of Irrigation Facilities	●	●	●		PMS method irrigation projects make extensive use of natural materials, avoiding concrete structures as much as possible. On the other hand, minor damage is expected due to the natural materials, and emphasis is placed on maintenance and management activities. Capacity development in water allocation operation, sediment management and facility repair will be provided through on-the-job training for at least three years after the completion of construction.	0.3
7.4 Large-Scale Repair and Restoration of Irrigation Facilities - Typical Destruction Patterns and Countermeasures	●	●	●		Large scale repairs and rehabilitation are carried out at the expense of the project implementation entities and the government, with the beneficiary farmers providing labour. The irrigation facilities in the PMS have been damaged and extensively rehabilitated, and improvements have been made through trial and error to reach the final form. Construction materials such as stones and gabion mattress have been stored for future emergency situation.	0.9

**Table 5.8.5 Explanatory Contents by Target (4)**

Table of Contents	Decision Maker (Project Implementation Entities)	Engineer	Mirab	Residents (Farmer)	Main Explanatory Contents	Credit (Hour)
Chapter 8 How should agriculture and irrigation technology be improved?						3.8
8.1 Establishment of Demonstration Farm for Technical Extension	●	●		●	A rural social survey conducted in 2018 to objectively assess PMS method irrigation projects revealed low crop productivity due to inappropriate irrigation practices. To address this, demonstration farm will be established in the beneficiary areas of several irrigation canal networks in order to efficiently disseminate cultivation techniques. During the project period, the project implementation entities will take the lead in establishing them, involving the DAIL (District Agriculture, Irrigation and Livestock Offices), and after the project, the WUA or IA will take the lead in managing them independently.	0.2
8.2 On-Farm Water Management		●		●	Appropriate water use in irrigated fields is an important issue for preventing waterlogging damage and improving crop productivity. Appropriate water management practices are described below. 1) Irrigation water distribution method; 2) Types of irrigation method in the field; 3) Flood irrigation, furrow irrigation and border irrigation technology; 4) New irrigation method suitable for Afghanistan (irrigation on ridges); and 5) Points to note in on-farm water management	1.4
8.3 Cultivation Technology		●		●	Effective technologies to enable sustainable and locally feasible crop cultivation to improve crop productivity in existing PMS irrigation project areas, such as. 1) Sustainable production by organic farming, 2) How to evenly sow seed in small-scale farm, 3) Effect of shade for improving productivity, 4) Raised bed cultivation in wetland to prevent waterlogged damage, 5) Increase in rice cultivation and countermeasures (introduction of appropriate upland rice varieties), 6) Improving nursery production (kneaded nursery bed)	1.4
8.4 Soil Improvement Technology		●		●	The soils in the study area are characterised by sandy and high pH, and these soils are fragile and difficult to manage. Soil improvement techniques are described below. 1) Topsoil improvement by soil profile survey; 2) Soil analysis for appropriate soil management; and 3) Maintaining soil fertility with leguminous crops cultivation	0.9
Appendix						1.8
Analysis Method for Sandbar and Scouring Using Hydraulic Parameters		●			1) Classifications of Sandbar; 2) Analysis of Scouring	0.8
Example of Design Calculation for Irrigation Facilities		●			1) Example calculation for stable boulders, 2) Example design calculation of flush board for intake gate, 3) Calculation example of sand flushing capacity of sand flushing dike, 4) Examination of cross-sectional area of underground pipe of siphon, 5) Example calculation for sand flushing capacity of drain gate	1.1



### 5.8.2 Training Schedule (draft)

A draft training schedule is shown as follows, expecting four days for decision maker (project implementation entities) including one-day field training, ten days for engineers, including two-day field training, three days for Mirab, including one and a half days of field training and four days for residents (farmers) including one and a half days of field training.

**Table 5.8.6 Training Schedule (draft)**

**[For Engineer]**

Number of days	AM/PM	Timetable	Chapter	Hr	Number of days	AM/PM	Timetable	Chapter	Hr
Day 1	AM	9:00 - 9:30	Brochure	0.5	Day 6	AM	9:00 - 10:30	4.5	1.5
		9:30 - 10:00	DVD	0.5			10:30 - 10:45	Break	
		10:00 - 11:00	1.1~1.4	1.0			10:45 - 11:45	4.6	1.0
		11:00 - 11:15	Break			PM	13:15 - 13:30	5.1	0.3
		11:15 - 12:30	1.5, 1.6	1.3			13:30 - 15:15	5.2	1.8
	PM	14:00 - 14:30	1.7, 2.1	0.5			15:15 - 15:30	Break	
		14:30 - 15:30	2.2(1)	1.0			15:30 - 17:00	5.3	1.5
		15:30 - 15:45	Break		Day 7	AM	9:00 - 10:30	6.1	1.5
		15:45 - 17:00	2.2(2)	1.3			10:30 - 10:45	Break	
							10:45 - 12:15	6.2	1.5
Day 2	AM	9:00 - 11:00	2.3	2.0		PM	13:45 - 15:15	6.3~6.5	1.5
		11:00 - 11:15	Break				15:15 - 15:30	Break	
		11:15 - 11:45	3.1	0.5			15:30 - 16:30	6.6~6.8	1.0
		11:45 - 12:15	3.2(1)	0.5	Day 8	AM	9:00 - 12:00	Site Visit (Marwarid, Kashkot, Bal-Kashkot)	3.0
	PM	13:45 - 14:45	3.2(2)	1.0			14:00 - 17:00	Site Visit (Sheiwa, Shetlaw Vil., Gamberi Farm)	3.0
		14:45 - 15:15	3.3	0.5	Day 9	AM	9:00 - 10:00	7.1	1.0
		15:15 - 15:30	Break				10:00 - 10:15	Break	
		15:30 - 17:00	3.4(1)	1.5			10:15 - 11:45	7.2, 7.3	1.5
Day 3	AM	9:00 - 12:00	Site Visit (Qasimabad, Kama I, Kama II)	3.0		PM	13:15 - 14:15	7.4, 8.1	1.0
	PM	14:00 - 17:00	Site Visit (Miran, Shigi, Marwarid II)	3.0			14:15 - 15:45	8.2	1.5
Day 4	AM	9:00 - 10:30	3.4(2)	1.5			15:45 - 16:00	Break	
		10:30 - 10:45	Break				16:00 - 17:30	8.3	1.5
		10:45 - 11:30	3.5	0.8	Day 10	AM	9:00 - 10:00	8.4	1.0
		11:30 - 12:00	3.6	0.5			10:00 - 10:15	Break	
	PM	13:30 - 14:30	4.1	1.0			10:15 - 11:45	Appendix(1)	1.5
		14:30 - 15:30	4.2(1)	1.0		PM	13:15 - 14:45	Appendix(2)	1.5
		15:30 - 15:45	Break				14:45 - 15:00	Break	
		15:45 - 17:15	4.2(2)	1.5			15:00 - 15:45	Appendix(3)	0.8
Day 5	AM	9:00 - 10:30	4.2(3)	1.5			15:45 - 17:00	Review	1.3
		10:30 - 10:45	Break						
		10:45 - 12:00	4.2(4)	1.3					
	PM	13:30 - 15:30	4.3	2.0					
		15:30 - 15:45	Break						
		15:45 - 17:30	4.4	1.8					

**【For Decision Maker (Project Implementation Entities)】**

Number of days	AM/PM	Timetable	Chapter	Hr
Day 1	AM	9:00 - 9:30	Brochure	0.5
		9:30 - 10:00	DVD	0.5
		10:00 - 11:00	1.1 ~ 1.4	1.0
		11:00 - 11:15	Break	
		11:15 - 12:30	1.5, 1.6	1.3
	PM	14:00 - 14:30	1.7, 2.1	0.5
		14:30 - 15:30	2.2(1)	1.0
		15:30 - 15:45	Break	
		15:45 - 17:00	2.2(2)	1.3
Day 2	AM	9:00 - 11:00	2.3	2.0
		11:00 - 11:15	Break	
		11:15 - 11:45	3.1	0.5
		11:45 - 12:15	3.2(1)	0.5
	PM	13:45 - 14:45	3.2(2)	1.0
		14:45 - 15:15	3.3	0.5
		15:15 - 15:30	Break	
Day 3	AM	9:00 - 12:00	Site Visit (Kama I , Kama II , Miran, Marwarid II )	3.0
	PM	14:00 - 17:00	Site Visit (Kashkot, Marwarid, Shetlaw Vil., Gamberi Farm)	3.0
Day 4	AM	9:00 - 9:30	5.1	0.5
		9:30 - 11:00	6.1	1.5
		11:00 - 11:15	Break	
		11:15 - 12:15	7.1	1.0
	PM	13:45 - 15:15	7.2, 7.3	1.5
		15:15 - 15:30	Break	
		15:30 - 16:30	7.4, 8.1	1.0

**【For Mirab】**

Number of days	AM/PM	Timetable	Chapter	Hr
Day 1	AM	9:00 - 9:30	Brochure	0.5
		9:30 - 10:00	DVD	0.5
		10:00 - 10:20	1.1, 1.2	0.3
		10:20 - 10:30	2.1	0.2
		10:30 - 10:45	Break	
		10:45 - 12:00	7.1	1.3
	PM	13:30 - 15:00	7.2, 7.3	1.5
		15:00 - 15:15	Break	
		15:15 - 16:15	7.4	1.0
Day 2	AM	9:00 - 12:00	Site Visit (Kama I , Kama II , Marwarid II )	3.0
	PM	14:00 - 17:00	Facility Operation Training (Marwarid II)	3.0
Day 3	AM	9:00 - 12:00	Facility Operation Training (Marwarid II)	3.0

**【For Resident (Farmer)】**

Number of days	AM/PM	Timetable	Chapter	Hr
Day 1	AM	9:00 - 9:30	Brochure	0.5
		9:30 - 10:00	DVD	0.5
		10:00 - 10:20	1.1, 1.2	0.3
		10:20 - 10:45	1.7	0.4
		10:45 - 11:00	Break	
		11:00 - 11:15	2.1	0.3
		11:15 - 12:15	6.2(1)	1.0
	PM	13:45 - 14:30	6.2(2)	0.8
		14:30 - 16:00	6.3 ~ 6.5	1.5
		16:00 - 16:15	Break	
		16:15 - 17:15	6.6 ~ 6.8	1.0
Day 2	AM	9:00 - 10:00	7.1	1.0
		10:00 - 10:30	8.1	0.5
		10:30 - 10:45	Break	
		10:45 - 12:15	8.2	1.5
	PM	14:00 - 17:00	Site Visit (Kama I , Kama II , Marwarid II )	3.0
Day 3	AM	13:45 - 15:15	8.3	1.5
		15:15 - 15:30	Break	
		15:30 - 16:30	8.4	1.0
	PM	14:00 - 17:00	Agricultural Training (Gamberi Farm)	3.0
Day 4	AM	9:00 - 12:00	Agricultural Training (Gamberi Farm)	3.0



### 5.8.3 Discussions on Training Curriculum

Discussions on training curriculum using PMS method irrigation project guidelines were conducted online as follows:

Method: online

Date: October 6, 2022

Explanatory contents: Since the lectures and explanatory contents of training using PMS method irrigation project guidelines vary according to decision maker (project implementation entities), engineers, Mirab, residents (farmer) and other trainees, the concept of the training curriculum formulation, explanatory contents and schedule by target were explained.

**Tables 5.8.1 to 5.8.6** describe the concept of the training curriculum formulation, explanatory contents according to target trainees and training schedule (draft). In explanatory discussions, expected trainees as decision maker (project implementation entities) and engineers and expected lecturers and trainees were confirmed. The discussions were summarized as follows:

- Administrative officials of Afghan ministries were originally considered as decision maker. Since the political upheaval in August 2021, however, such functioning administrative officials have left. As far as supporting administrative officials, PMS and FAO can be proxies for decision maker.
- PMS engineers and those of private companies (construction, consulting etc.) in Afghanistan are expected to be target engineers.
- Lecturers include Japanese consultants and Peshawar-kai members as well as local PMS members. Japanese consultants will mainly handle the engineering part in the PMS method irrigation guidelines while executing and disseminating projects methods will be lectured jointly by Peshawar-kai members and Japanese consultants.
- Training should aim to nurture instructors. For administrative officials or FAO and PMS as their proxies, training is intended to nurture leaders involved in executing and disseminating projects. In terms of engineering, training is expected to be conducted for design consultants and engineers of a construction company tasked with planning and designing PMS methods in Afghanistan.

Participants: participants of training curriculum discussions are listed in **Table 5.8.7**.

**Table 5.8.7 List of Participants in Discussions on the Training Curriculum**

No.	Name	Organization	Position
1	Mr. Koji Shimizu	JICA	South Asia Division 2, South Asia Department Planning Officer (General Secretary of Afghanistan)
2	Ms. Chisato Yanagisawa	JICA	South Asia Division 2, South Asia Department Specialist commissioned officer (project officer)
3	Dr. Masaru Murakami	Peshawar-kai	PMS President
4	Ms. Chiyoko Fujita	Peshawar-kai	Chief of PMS Support Unit
5	Mr. Sora Akazawa	Peshawar-kai	PMS Support Unit
6	Mr. Takafumi Momii	Peshawar-kai	PMS Support Unit
7	Mr. Hayato Yamashita	Peshawar-kai	PMS Support Unit
8	Mr. Suihei Kabayama	Peshawar-kai	PMS Support Unit
9	Mr. Hideki Konno	CTII	Chief Consultant